SCIENTIFIC AMERICAN

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

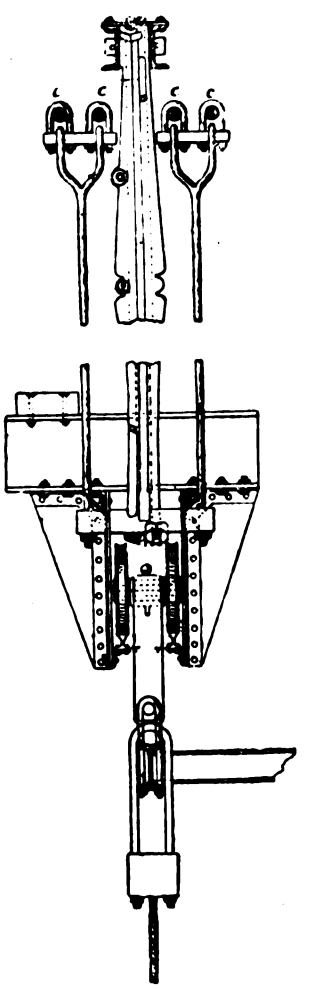
Vol. LIX.—No. 13. ESTABLISHED 1845. NEW YORK, SEPTEMBER 29, 1888. $3.00 A YEAR. WEEKLY.

PROPOSED BRIDGE WITH MOVABLE FLOOR OVER THE RIVER BILBOA, SPAIN.

The city of Bilboa is on the northern coast of Spain, situated about 12 miles from the mouth of the river of same name. At the river entrance, on each opposite side, are the enterprising towns of Arenas and Portugalete. Although each town has its railway and tram car line to Bilboa, no steam ferry or bridge exists to establish communication across the stream. One difficulty as to a bridge has been the great expense, having in view the arrangement of the proper grades. The problem, however, has been lately solved by a talented architect, M. Alberto Palacio, who has designed a movable bridge, of which we herewith give engravings from *La Ilustracion Espanola*.

The structure is on the suspension principle. At the dock line on each side of the river are two iron piers, on which the bridge cables are supported as shown. The towers and cables need only to have strength enough to support themselves and a suspension platform or car on which the traffic is carried. Hence the construction is much lighter and less costly than an ordinary bridge would be. Between the towers two pairs of rails are arranged, as shown in our cross section, on which runs a truck, pendent from which, by means of a skeleton frame and guy ropes, is a platform for passengers, carriages, horses and carts, etc. This platform is hauled back and forth across the river by means of an endless cable worked by steam engine at the base of one of the towers. The platform moves on a level with the street grade on either side of the river, and is, therefore, very convenient of access for all kinds of traffic.

The height of the bridge at the center of the span is about 150 feet above high water, thus allowing plenty of clearance for vessels. The estimated cost of the work is $75,000. It is expected the bridge will be soon



erected. This structure is on the same general plan as that of Mr. John F. Anderson, of this city, which was designed to span the Hudson River between New York and Jersey City. The Anderson bridge was on a much larger scale, and the platform or movable floor was intended to carry a full railway train. It was illustrated and described in the SCIENTIFIC AMERICAN of January 24, 1885.

Quillaya Bark in Catarrh.

Dr. Trechinski writes in the *Ejenedelnaya Klinicheskaya Gazeta* that he finds powdered quillaya bark of great service in both acute and chronic catarrhal rhinitis. It is put in a paper bag and the patient directed to shake it up and snuff up the dust from it every few minutes. At first the secretion is increased, and is of a brownish or yellowish color from the admixture of pus cells. After a very short time, however, it diminishes in quantity, and becomes quite colorless. The nose then becomes dry, and the passage through it clear. If the use of the quillaya is prolonged, the secretion is continued, but is quite colorless. The powder, when introduced into the nares and pharynx, appears to increase the secretion from the mucous membrane, but at the same time to remove all the pathogenic matter existing there.

The Australasian Association for the Advancement of Science.

The formation of this association, which already gives promise of being a great success, was first suggested by Professor Liversidge, of the Sydney University, during the exhibition in Sydney in 1879.

The first general meeting was fixed at the Sydney University, for August 28.

The number of members at the end of July exceeded 400.

PROPOSED BRIDGE WITH MOVABLE FLOOR OVER THE RIVER BILBOA SPAIN.

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.

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The Scientific American Supplement

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NEW YORK, SATURDAY, SEPTEMBER 29, 1888.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 665.

For the Week Ending September 29, 1888.

Price 10 cents. For sale by all newsdealers.

ELECTRIC LIGHTING INFORMATION.

The National Electric Light Association are establishing a permanent headquarters in New York City; a practical electrician having already been appointed at a handsome salary to give his entire attention to the laudable project it is designed to carry out. Only these who have had to do with electricity and its applications can be fully aware how hard it is to keep up with the times in other departments save your own, and indeed even in that one must needs do a deal of reading and not a little travel. At the last convention one of the best known electrical engineers in the country innocently claimed as his own invention a contrivance that, in some parts, has been in use for nearly three years; there had been so much to read, so many new things to study and ponder over in applied electrics, he had not yet "got round" to what was really an anticipation of his own mechanism. It is now but a few weeks since the electric light men met and discussed some few of the most important matters, and yet he would be a bold man who should to-day attempt to describe the best known means of construction and of operation, of stopping leaks, of locating interferences amid counter-interferences, and the like.

Indeed, so much has been done in each particular department of electrical projection, that it is not possible in the three days sitting of a convention—no! nor in 30 days, or a whole year—to go over all the more or less valuable experiments that have been made and recorded; for, fortunately enough, all the big companies have careful records made of what is done in the way of experimentation in their machine shops and laboratories. Experiments innumerable have been made which, though proving of no value to those making them, are valuable to science and invaluable, perhaps, to those operating in other directions. Nor is there any let-up. Experience, experiment, and discovery are increasing rather than diminishing as time goes on, and it is becoming more and more difficult to keep informed of all that is being or has been done, and, consequently, men undertake great tasks in laboratory and workshop only to learn what was long since known, but hidden away among the musty records of a great workshop.

The permanent headquarters now being established by the National Electric Lighting Association will contain copies of all the records that can be borrowed for the purpose. Information will be asked for in every department, with description of experiments, whatever was their result, and an attempt will be made to index all these, so that whatever is wanted may be readily found. Let us say a subscriber wants to know what has been done in the way of looking for enduring filaments for incandescence lamps, or what experiments have been made with certain kinds of insulating material. He has only to send to or call at the headquarters, and every facility will be given him for finding what he wants to know.

Again, experimental results that are not any use to a man furnishing light might be of great service to one selling power, and *vice versa*. Did you ever make a laboratory experiment with a distinct purpose, and discover that though you had not progressed your own work, you had gained some apparently important information in another direction? One of the duties of the new establishment will be to make known such "finds" to those likely to be benefited—a general exchange being valuable all around—and in many other ways to lighten the labors and inform the minds of working electricians.

POSITION OF THE PLANETS IN OCTOBER.

VENUS

is evening star. She is plainly visible in the southwest soon after sunset, setting on the 1st about an hour after the sun, and on the 31st a little more than a hour and a quarter. She must be looked for about 8° south of the sunset point. She is in conjunction with Beta Scorpii on the 26th, being nearly 2° south of the star. Venus sets on the 1st at 6 h. 26 m. P. M. On the 31st she sets at 6 h. 11 m. P. M. Her diameter on the 1st is 11″, and she is in the constellation Virgo.

MERCURY

is evening star. He reaches his greatest eastern elongation on the 8th at 11 h. A. M., being 25° 14′ east of the sun. He may then be seen with the naked eye in the west, three-quarters of an hour after sunset, but will be difficult to find on account of his southern declination, as, at that time, he is 11° south of the sunset point. He retraces his steps toward the sun after elongation, and meets Venus on the 9th at 6 h. P. M., passing 3° 9′ south. Observers, who can easily find Venus, may pick up Mercury with the aid of an opera glass, knowing his distance and direction from the larger planet. One other incident marks the course of the swiftly moving planet, for he is in inferior conjunction with the sun on the 31st at 7 h. P. M., and becomes morning star. Mercury sets on the 1st at 6 h. 19 m. P. M. On the 31st he rises at 6 h. 27 m. A. M. His diameter on the 1st is 6″, and he is in the constellation Virgo.

JUPITER

is evening star. He is in conjunction with Antares on the 24th, being 5° north of the star. He is near Venus at the close of the month, being 1° 30′ northeast. Both planets set then about 6 o'clock, an hour and a quarter after sunset. Jupiter sets on the 1st at 8 h. 1 m. P. M. On the 31st he sets at 6 h. 23 m. P. M. His diameter on the 1st is 32″.2, and he is in the constellation Scorpio.

MARS

is evening star. He pursues his eastward or retrograde course, diminishing in size and ruddy light, and increasing the distance between Jupiter and himself. Mars sets on the 1st at 8 h. 30 m. P. M. On the 31st he sets at 8 h. 3 m. P. M. His diameter on the 1st is 6″.8, and he is in the constellation Scorpio.

URANUS

is evening star until the 10th, and after that time morning star. He is in conjunction with the sun on the 10th at 8 h. A. M. Uranus sets on the 1st at 5 h. 55 m. P. M. On the 31st he rises at 4 h. 47 m. A. M. His diameter on the 1st is 3″.4, and he is in the constellation Virgo.

SATURN

is morning star. He may be easily found, in the northeast, in the small hours of the morning, and may be known by his serene light and his position, about 11° northwest of Regulus. Saturn rises on the 1st at 1 h. 28 m. A. M. On the 31st he rises at 11 h. 42 m. P. M. His diameter on the 1st is 16″, and he is in the constellation Leo.

NEPTUNE

is morning star. He rises on the 1st at 8 h. 1 m. P. M. On the 31st he rises at 6 h. 1 m. P. M. His diameter on the 1st is 2″.6, and he is in the constellation Taurus.

Venus, Jupiter, and Mars are evening stars at the close of the month. Mercury, Uranus, Saturn, and Neptune are morning stars.

A Ruined City in Texas.

The surveys at present being made for the Kansas City, El Paso and Mexican Railroad, at a point north latitude 33 degrees and west longitude 106 degrees, have passed along the lava flow which by the local population is called the Molpais. It consists of a sea of molten black glass, agitated at the moment of cooling in ragged waves of fantastic shapes. These lava waves or ridges are from ten to twelve feet high, with combing crests. This lava flow is about forty miles long from northeast to southwest, and from one to ten miles wide. For miles on all sides the country is the most desolate that can be imagined. It has been literally burnt up. It consists of fine white ashes to any depth which, so far, has been dug down. To the north of the lava flow, and lying in a country equally desolate and arid, the surveyors have come upon the ruins of Gran Guivera, known already to the early Spanish explorers, but which have been visited by white men less often even than the mysterious ruins of Palenque, in Central America. Only a few people at Socorro and White Oaks have been at Gran Guivera, because it is at present forty miles from water. The surveyors found the ruins to be of gigantic stone buildings made in the most substantial manner and of grand proportions. One of them was four acres in extent. All indications around the ruins point to the existence here at one time of a dense population. No legend of any kind exists as to how this great city was destroyed or when it was abandoned. One of the engineers attached to the surveying expedition advances the theory that Gran Guivera was in existence and abundantly supplied with water at the time the terrific volcanic eruption took place.

The Electric Arc Light.

Talking and writing about the discovery of the electric arc light, we rightly ascribe it to Sir Humphry Davy. But we nearly always give the date as 1809. It seems, however, that if Davy did not actually hit the bull's eye in 1800 and 1802, he got at least within the center circle.

Nicholson's Journal for October, 1800, contains a letter signed by Davy, which states that he has discovered that "well burned charcoal possesses the same properties as metallic bodies in producing the shock and spark when made a medium of communication between the ends of the galvanic pile of Signor Volta."

And in the *Journal of the Royal Institution*, vol. i., of 1802, Davy describes some experiments upon the sparks yielded by the voltaic pile, and states: "When, instead of the metals, pieces of well burned charcoal were employed, the spark was still larger and of a vivid whiteness." One is inclined to think that this spark was a true arc as now understood.—*Electrical Engineer.*

Sticky Fly Paper.

Take of—

Resin	14 parts.
Burgundy pitch	4 parts.
Molasses	4 parts.
Linseed oil	4 parts.

Heavy calendered paper should be used, or in a few days your fly paper will be sticky on both sides.

Electrical Transmission of Power.

The flour mill at Laramie, Wyoming Ty., driven by an electric motor, which has been widely advertised in milling and electrical journals, is a novelty which has excited considerable interest, and prompts an inquiry as to what extent electricity may be made available for transmitting power from inaccessible points or poor locations to sites which offer superior advantages aside from the power required.

In considering the transmission of power either by electricity or otherwise, the items of cost and efficiency are all-important in determining whether it can be made a commercial success. A water power may be of large amount and easily controlled, but if only a fraction of the power can be delivered at a distance of a few miles, and that at a cost per horse power equal to or in excess of the cost per horse power developed by a good steam plant, it will not be utilized. In this connection, the data given in Kapp's "Electrical Transmission of Energy" are of interest. The comparative commercial efficiency of electric, hydraulic, pneumatic, and wire rope transmission is shown in the following table:

Distance.	Electric.	Hydraulic.	Pneumatic.	Wire Rope.
825 feet,	0·69	0·50	0·55	0·96
1,625 "	0·68	0·50	0·55	0·93
3,900 "	0·66	0·50	0·55	0·90
3 miles.	0·60	0·40	0·50	0·60
6 "	0·51	0 35	0·50	0·36
12 "	0·32	0·20	0·40	0·13

For three miles or less wire rope transmission is the most economical, and for longer distances electricity is the most economical, but at a distance of twelve miles only one-third of the power developed can be delivered at the receiving station. The relative cost per horse power at the receiving station, as compared with that of steam power, will, of course, depend upon the capital outlay required, cost of fuel, maintenance, repairs, etc., and would vary widely in different localities. As the efficiency rapidly decreases with increased distance, it would seem that electrical transmission cannot be employed profitably at distances of over ten or fifteen miles, and then only where the power is largely in excess of the requirements at the receiving station. As the commercial efficiency of electrical transmission, even at short distances, will not average a delivery of over sixty per cent of the power developed at the primary station, and as the water powers within short distances of flouring mills are generally limited, it is not likely that the experiment at Laramie will be often repeated. Even at that point, it was made, not because it was economical, but as a curiosity. In this connection it may be added that much is hoped, in the way of electrical transmission, from the Tesla alternating current motor. If it performs all that is promised for it, it will extend the limit of distance and decrease the cost of wires for transmission, but even at the best it does not appear that any great distance can be covered.—*Milling Engineer.*

Bitumen from Sludge Acid.

W. P. Thompson, in the *Journal of the Soc. Chem. Industry*, gives some account of Rave's process for obtaining valuable products from this waste material. The tarry acid is kneaded with iron borings or filings, copper or zinc or other metallic cuttings, the material preferred being iron cuttings or borings. After more or less prolonged contact, depending upon the nature of the metal and its degree of fineness, the sulphuric acid will be found to have combined with the metallic base. The mass is now introduced into heated receptacles and boiling water is added. The metallic sulphate dissolves and separates from the black mass, and the latter melts and rises to the surface. It is withdrawn from the receptacle, and is found to have all the mechanical properties of the best purified soft bitumen. It is well washed with hot water to remove all traces of salts, and the wash water used to dissolve out fresh quantities of salts in a succeeding operation. Any uncombined metal falls to the bottom. The watery solution containing the metallic sulphate and other salts is drawn off into crystallizing reservoirs.

The black mass, or bitumen, being too soft for many purposes, is placed in a still and heated until it assumes the required degree of hardness. The hydrocarbons given off in this operation are collected and used as naphtha. The resulting bitumen is very pure, and can be used for almost all purposes for which the purest native bitumens are used, while at the same time it is so elastic and malleable as to strongly resemble India rubber. Hence it is largely sold by the Societe Oleograisse, who work the Rave process under the name of "mineral caoutchouc-bitumen." One ton of acid tar produces about ten hundredweight of this purified bitumen. If the distillation of the soft bitumen be carried farther, a material soluble in naphtha, but nearly as hard and tough as ebonite, is obtained. This is an extremely good non-conductor of electricity, is unacted upon by acids or alkalies, and is therefore adapted for making galvanic batteries, for coating acid tanks, conducting wires and cables, for insulation plates, and the like. It can be made of all degrees of hardness and moulded by heat, either pure or admixed with fibrous and strengthening materials.

If the mineral caoutchouc-bitumen be mixed with about forty per cent of sawdust and a little lime, heated in an iron vessel and pressed into moulds, it makes an admirable fuel, burning well in a fireplace without melting and with little ash.

The "mineral caoutchouc-bitumen" dissolves readily in petroleum, naphtha, and other light hydrocarbons, and forms an excellent tough black varnish. This varnish is waterproof, and adheres very tightly to metal, not chipping or scratching off so easily as Brunswick black or japan varnish. The bitumen also forms compounds with resin, wax, pitch, and other like materials, with qualities intermediate between those of their constituents.

To sum up, at the expense of the requisite quantity of iron cuttings or oxide the entire sulphuric acid in the material is obtained as green vitriol. One-half the weight of the original acid tar is utilized as soft bitumen, or this is still further differentiated by distillation, and this fifty per cent is converted into seventeen per cent light naphtha and burning oils, eight per cent heavy lubricating oils, and twenty-five per cent metallic carbon.

Obituary.

HENRY CARVILL LEWIS.—Professor Lewis, of Philadelphia, died at Manchester, England, on the 21st of July, in his thirty-fifth year. He was a graduate of the University of Pennsylvania, an active member of the Academy of Sciences of Philadelphia, and in 1883 became Professor of Geology in Haverford College. One of his earliest papers, if not the first, is a notice of the Zodiacal Light, giving the results of five years' observations; it was read before the American Association in 1880, and appeared in vol. xx. (1880) of this *Journal*. He commenced his glacial investigations in 1879, in connection with the Geological Survey of Pennsylvania, worked on the same subject in 1885 and 1886 in Great Britain, and had intended to make observations the present season in Norway. The investigation of the "Terminal Moraine" from the eastern boundary of Pennsylvania (to which point it had been traced across New Jersey, by Professor G. H. Cooke), westward across Pennsylvania, occupied him until the autumn of 1882, when his report, of about 800 pages, was presented for publication. It appeared in 1884, as No. Z of the Geological Series of the Pennsylvania Survey. In 1886 he read his paper on Glaciation in Great Britain before the British Association.

Professor Lewis was also a zealous mineralogist, and until recently had editorial charge of the mineralogical department of the *American Naturalist*. In 1886 he brought out his paper on the "Genesis of the Diamond," tracing it to eruptive rocks, and basing his views principally on the published accounts of the diamond fields of Southern Africa.

Mr. Lewis was an enthusiastic and energetic worker in science, and promised to do much for its progress. He leaves a wife and one child.

JAMES STEVENSON.—Col. Stevenson died on the 25th of July. He was born in 1840, at Maysville, Kentucky. He was an early explorer of the Rocky Mountain region, and accompanied Dr. Hayden in his expedition as executive officer and manager. In 1872 he ascended the highest of the Teton Range, the Great Teton. He has been, since 1879, connected with the U. S. Geological Survey, engaged in making ethnological investigations and collections in New Mexico and Arizona. A very valuable report by him on the collections obtained in 1879 and 1880 is contained in the report of the secretary of the Smithsonian Institution for 1881.

ALBERT D. HAGER.—Mr. Hager was associated with Professor Edward Hitchcock and Mr. C. H. Hitchcock in the Geological Survey of Vermont. Since 1872 he has lived in Chicago, where he died, on the 29th of July. He was born at Chester, Vermont, in 1817.—*Amer. Jour. Science.*

Why Does the Shell of the Lobster Become Red on Being Boiled?

The answer to this question in general terms is that the salts which go to make the color in the shell undergo a chemical change by being subjected to the action of hot water. This answer can hardly be a satisfactory one to a person seeking specific information on the subject. It is, however, the only answer that can be given at present. The matter is one which has apparently excited more popular than scientific curiosity, for whereas the question has often been asked, it has not as yet received a satisfactory—that is, a specific—answer. It is a question for the chemist rather than for the naturalist, and that, probably, is the reason why it has not received more attention.

It is not only the lobster, but all crustaceans that undergo this change of color on being boiled. Salt water crustaceans become redder in the process than fresh water crustaceans. The addition of common table salt to the water in which the creature is boiled will conduce to greater redness. Whether it is the sodium or the chlorine in the salt that helps to this result I do not know. The creature itself has nothing to do with the change in its shell, for if the shell be taken from the living crustacean and then boiled, the result will be exactly the same. It has been suggested that red may be the basic color of the shell, and that the chemical change which takes place is merely the elimination of the other colors. The objection is that there is no evidence of removal of color shown in the water. The objection is not vital, however.

Dampness in Foundations.*

A wall constructed of brick or stone of any quality whatever will be subject to the damp which exists in the soil, and which will enter in all directions and in all parts where the wall is in immediate contact with the ground. The extent to which this damp will penetrate cannot be determined, and it may rise to a very great height above the level of the soil; and if it be arrested more or less, that will be caused by the influence of the neutralizing power of the temperature of the atmosphere; so that a wall which may be very damp at the beginning of summer will be much less so at the end of the dry season, and particularly so if immediately exposed to the sun, but the following winter the damp will return, unless the original causes of humidity be subdued.

It is desirable in all and every class of soil to have a substratum of concrete under the footings. For the purposes of damp this need not be very deep, perhaps not exceeding a foot high. As soon as the footings and lower part of the wall are carried as high as the level of the ground inside, it will be well to introduce a thin sheet of lead the whole thickness of the wall, or a layer of bituminous substance as thin as possible, so as to penetrate the brick and stone and fill the pores, or a double course of thick slate set in cement. The purpose of the sheet of lead and of the bituminous substance, and the slating, is to prevent the wet from rising up from the footings. But other precautions are necessary to prevent the access of damp from the surface of the ground next the outside face of the wall. A facing of stone is the best remedy. It need not be very thick, but it is well for it to be at least two or three feet high; and if a small interval between this facing slab and outside surface of the wall, so much the better, provided a circulation of air be kept up in the space. By this provision neither the rain beating against this part of the wall, nor the water returning from the pavement or ground, will be able to reach the main substance of the wall; for although the facing slabs may be temporarily damped, they will soon be dried without communicating the damp to the body of the wall.

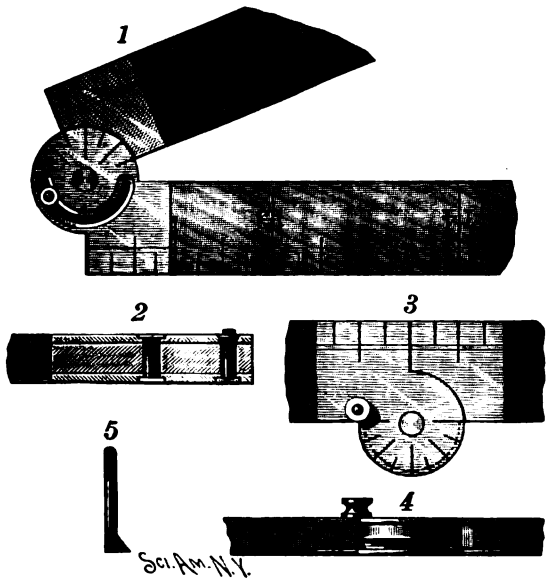
The inside of external walls should never have the plastering applied immediately on the face. They should be battened by means of long narrow slips of wood attached by holdfasts to the inside face of the wall. These slips or battens receive the laths upon which the plastering is applied. The space formed by the battens between the wall and the lathing effectually keeps out the humidity. No impervious covering should be laid on wooden floors in the lowermost story, such as oil cloth for instance; a certain moist air always rises from the ground and escapes through the joints of the boards, but if this be intercepted by an oil cloth the air will rot the boards and oil cloth in a very few months. But it is important to keep the damp from the floors which come upon the ground, that is, the floors of the lowermost story.

It is evident that the timber of stone slabs should not be in immediate contact with the soil. For this purpose let a stratum of concrete be laid over the whole surface of the house, six or nine inches thick at the least. Upon this form sleeper walls or piers up to the necessary height, and on them lay the plates or paving slabs. As an additional precaution, a thin sheet of lead might be laid under each pier on the bed of the sleeper walls. In palaces, as a greater precaution, and in buildings where expense is a secondary object, a thickness of asphalt might be laid on the concrete. In the dwellings of the poor it is expedient at all events to have the sleeper walls or piers, which need be only half brick wide and one course high, without the cement, and generally that will be a sufficient precaution. Where stone paving forms the floor, bricks must be laid under all the joints. Thus will the humidity be more or less prevented from reaching the floors. But of all precautions to prevent damp entering by the face of the wall, the best remedy is to have an area, which, by keeping the soil at a distance, precludes its fatal effects on the wall. These areas may be three or more feet wide, and may serve as a passage all round the building, and afford access to cellars outside, as in the London houses; or if this, from want of space or the expense, be impracticable, it will be sufficient to have what are called blind areas, with convex walls against the earth, the points of contact with the outer wall of the house being as small as possible, to diminish the possibility of the communication of damp.

* Vandoyer, in *The Architect*, London.

AN IMPROVED CARPENTER'S RULE.

A carpenter's rule so constructed that it may be used as a bevel or square as well as a rule has been patented by Mr. Michael H. Walsh, of No. 9 Gloucester Place, Boston, Mass., and is illustrated herewith, Figs. 1 and 2 showing a plan view and horizontal section. The

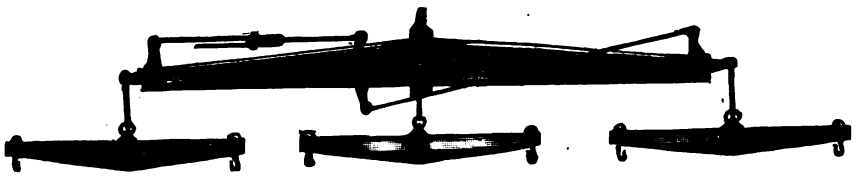


WALSH'S CARPENTER'S RULE.

joint consists of a circular projection on one leg of the rule centrally pivoted between two projections on the other leg, a pin or screw passing through a slot in one of the outer projections, and through the inner projection, with a countersunk nut resting in the slot, whereby the two legs of the rule may be set at any angle desired, for use as a bevel or square, according to the graduation marks on the projection. In Figs. 3, 4, and 5 a modified form of the improvement is shown, wherein the inner projection is formed with a beveled edge, and a pin with beveled projection is located in the inner end of one of the legs of the rule, the pin having a thumb nut and screw-threaded end, so that by screwing up the nut the projections are clamped together and the rule is held firmly in adjusted position.

AN IMPROVED DRAFT EQUALIZER.

A simple, cheap, and efficient equalizer for perfectly equalizing the draft of three or four horses is illus-

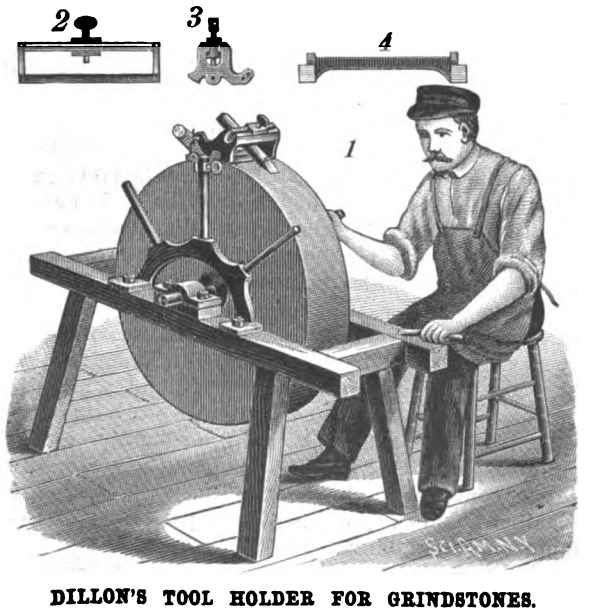


GILLET'S THREE-HORSE EQUALIZER.

trated herewith, and has been patented by Mr. A. F. Gillet, of Burlington Junction, Mo. It is made with a tripletree having a central draught hook, a three-armed or T-shaped lever being held by a bolt or pin to the tripletree at one side of its center, and so that the extremity of the long arm of the lever reaches about to the center of the tripletree, where it is provided with a draught hook to which the singletree for the middle horse is hitched. This equalizer does away with a great deal of cumbersome weight, admits of a short hitch, and by means of adjustable rods the equalizers may be easily and quickly adjusted to increase or decrease the draught on either of the horses, or adjusted to suit different kinds of work, such as from a plow to a lister equalizer, or to any implement having a tongue.

AN IMPROVED TOOL HOLDER FOR GRINDSTONES.

A holder with which a number of tools may be held at an angle to and in rigid contact with the periphery of a grindstone has been patented by Mr. James M. Dillon, of No. 17 Garden Street, Poughkeepsie, N. Y., and is illustrated herewith, Figs. 2 and 4 being front views, and Fig. 3 an end view of the holder. A segmental plate, from which projects radial arms, is secured to the frame upon each side of the stone. The base of the holder, which is slightly greater than the width of the stone, is adapted to be secured to either set of the radial arms by set screws. The end pieces of the body of the holder are pivoted to end projections of the base, so that the body may have an easy rocking movement, but an essentially U-shaped spring is secured to both the base and the holder, to normally give the latter a forward inclination, there being a catch to retain the holder in horizontal position when desired. The tool clamp is a rectangular block grooved to slide on the inner faces of the upper bars of the holder, and provided with a thumb screw to engage and hold in place the tool to be ground.



DILLON'S TOOL HOLDER FOR GRINDSTONES.

The Aeration of Sewage.

Some correspondence recently printed by the London Metropolitan Board of Works, at the request of Dr. Dupre, possesses considerable interest in relation to the treatment of sewage by aeration. It now appears, says the *Engineer*, that Dr. Dupre addressed a letter to Sir Joseph Bazalgette as far back as 1882, suggesting that the metropolitan sewage should be mechanically aerated between the pumping stations and the reservoirs, and perhaps again between the reservoirs and the river. The proposal made thus early has remained in abeyance until now, except so far as the floating fire engines are concerned, but is once more made prominent.

In his letter of July, 1885, Dr. Dupre puts the case very clearly by saying: "The destruction of organic matters discharged into the river in the sewage is, practically, wholly accomplished by minute organisms. These organisms, however, can only work in the presence of oxygen, and the more of that you supply, the more rapid the destruction." On the reality of the effect we have the testimony of Sir H. Roscoe, in his report of December last, where he states: "The rapid purifying effects of aeration on the sewage have been repeatedly observed in my laboratory experiments." The actual nature of the process is very remarkable. Sewage contains virtually no dissolved oxygen, and in this state serves to nourish only such organisms as are associated with putrefactive results. But where free oxygen exists, there arise a class of what may be termed "healthy" organisms, and these dispose of the organic matter in the sewage in such a manner as to render it inoffensive. Sewage poured into a river rapidly absorbs the free oxygen contained in the water, and if the quantity of sewage is in excess of a certain proportion, the dissolved oxygen is so largely absorbed that the healthy organisms perish, and the putrefactive process sets in. The use of aeration is not to oxidize the organic matter, but to supply the free dissolved oxygen needed for the respiration of the healthy organisms.

A SAFETY SHOE FOR CAR TRUCKS.

An invention providing means whereby, should the wheels of a car or locomotive jump the track, neither would be derailed, but would slide upon the track until the brakes could be applied and the wheels returned to their proper position, has been patented by Mr. Abram M. Woodruff, of Superior, Neb., and is illustrated herewith. To the central transverse timbers and to a longitudinal brace forming a portion of the truck frame is secured a head block positioned between the wheels, a shoe being firmly secured to the head block, as shown in the bottom plan view, Fig. 1, and the side elevation, Fig. 3. The shoes have downwardly extending side flanges, widest at their central portions and tapering toward each end, and between the flanges is a central horizontal flat bearing surface, with two inclined end surfaces, imparting to the bearing surface of the shoes the equivalent functions of a sleigh runner. The position of the shoes with relation to the rails when the wheels have jumped the track is shown in Fig. 2, the width of the shoe being enough greater than the width of the rail to assure engagement with the rail, even should the wheels be thrown a considerable distance. A modified form is made which is adapted for attachment to the locomotive. The shoes are made of metal, while the head blocks may be of any suitable material, as hard wood or metal.

AGAINST MOSQUITOES.—Take a small quantity of a 2 per cent carbolic acid solution, and sprinkle sheets, coverlet, pillow, and bolster, on both sides, the edges of bed curtains, and the wall next the bed. The face and neck may also be slightly wetted.

AN IMPROVED READING DESK.

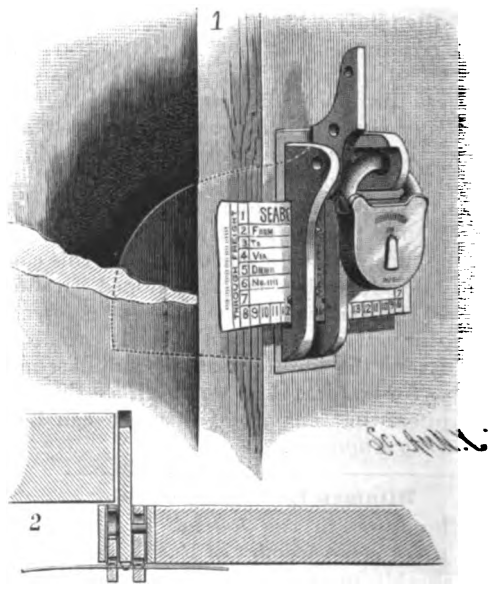
A light and simple reading desk, which is readily adjustable to any desired position, is illustrated herewith, and has been patented by Mr. Andrew J. Williford, of Nokomis, Ill. Its principal parts are preferably made of wire, a vertically adjustable inverted U-shaped bar

WILLIFORD'S READING DESK.

having its ends passed through eyes in the standards, where they are engaged by set screws, forming a support on which the book rest is mounted to turn. On the underside of the book rest, at each end, is secured a semicircular bar, these bars passing through eyes in the side supports, where they are adapted to be engaged by set screws to adjust the book rest to any desired angle.

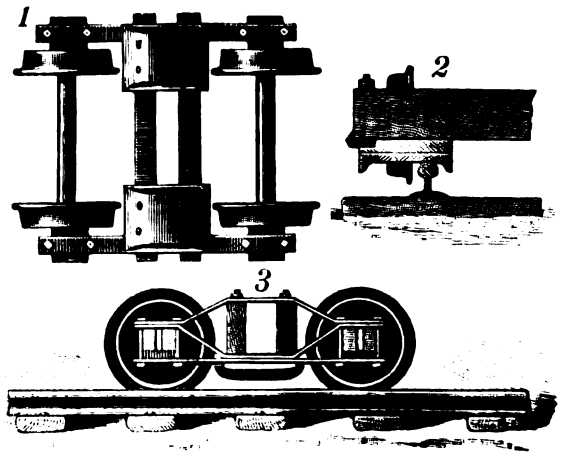
AN IMPROVED SEAL LOCK.

A lock especially designed to secure and seal the doors of freight cars is illustrated herewith, and has



GODWIN'S SEAL LOCK.

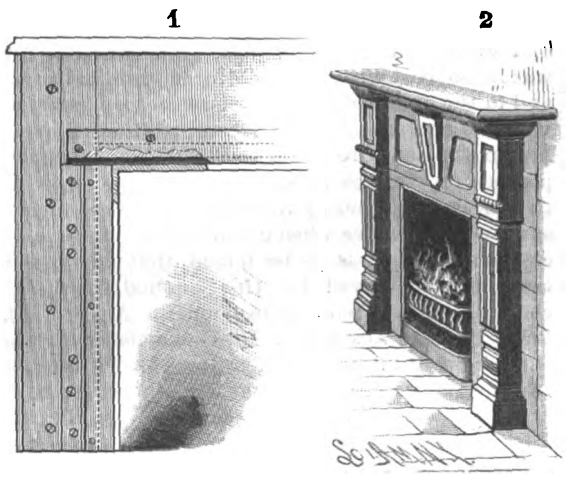
been patented by Mr. Le Roy C. Godwin, of Portsmouth, Va. A frame is held to slide in a casing secured to the car door, the frame having slots for the reception of a ticket or card, a tumbler plate being pivoted in the casing and passing through the frame. A cam turns on the pivot of the tumbler plate, and is adapted to be engaged by a lug on one side plate of the frame. The sealing card is water proof, and when locked in place in the slotted frame cannot be removed without being cut or torn in pieces. The lock is made of malleable iron, has no spring to get out of order, and is designed to be very simple and durable in its construction.



WOODRUFF'S SAFETY SHOE FOR CAR TRUCKS.

AN IMPROVEMENT IN MANTEL CONSTRUCTION.

A method of constructing mantel frames whereby one size may be readily and accurately fitted to fireplaces of different sizes has been patented by Mr. Robert B. Thompson, and is shown in the accompanying illustration. A wooden or other lintel having a longi-



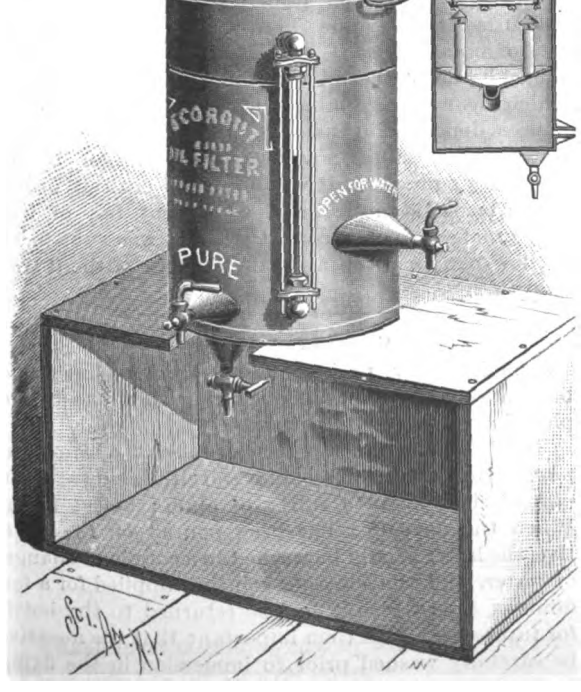
THOMPSON'S MANTEL.

tudinal groove in its lower edge is fastened along the back of the frieze, with its lower edge extending enough below it to make the opening the desired height, as shown in Fig. 1. Jambs having tongues on their upper ends to fit the groove in the lintel are cut to the desired length, and fastened to the backs of the side columns at the desired distance from the center line of the fireplace. The inner edges of the jambs and lintel, when properly adjusted, are lined with fire strips.

For further information relative to this invention address Messrs. Schuette & Co., corner of 18th and Mary Streets, Pittsburg, Pa.

AN IMPROVED FILTER FOR WASTE OIL.

A convenient filter for oil as it drips from bearings, or oil that has been made impure by the admixture of any foreign substance, has been patented by Mr. George W. Gallaway, of No. 322 Pearl Street, New York City, and is illustrated herewith, the main view also showing the shipping box, which is adapted to serve as a stand on which to set up the filter. As shown in the sectional view, there are two removable filtering pans in the top of the can, the bottom of the upper pan being perforated and covered with cotton, held in place by a metallic ring. Around the bottom edge of the lower pan are two flanges, adapted to hold in connection with rings two parallel layers of felt in position, the felt being firmly secured by thumb nuts and bolts. A partition with central depression separates the upper part of the can from the bottom, a central bottom opening in such partition leading through a pipe to an outer cock for the discharge of water setting to the bottom of the filtered oil. Two stand pipes in this partition allow for the overflow of oil into the lower compartment of the can, when the oil rises sufficiently. The pure oil is withdrawn through the lower cock in front, the bottom cock being for the removal of water, should any pass into the lower compartment, or for cleaning the filter. A glass gauge at the side indicates the amount and purity of the filtered oil standing in the filter. As the waste oil is poured on the cotton in the upper filtering pan, all the larger foreign particles of matter are retained there, the remaining finer particles being removed by the felt. The construction allows for the ready removal of the filtering material for cleansing.



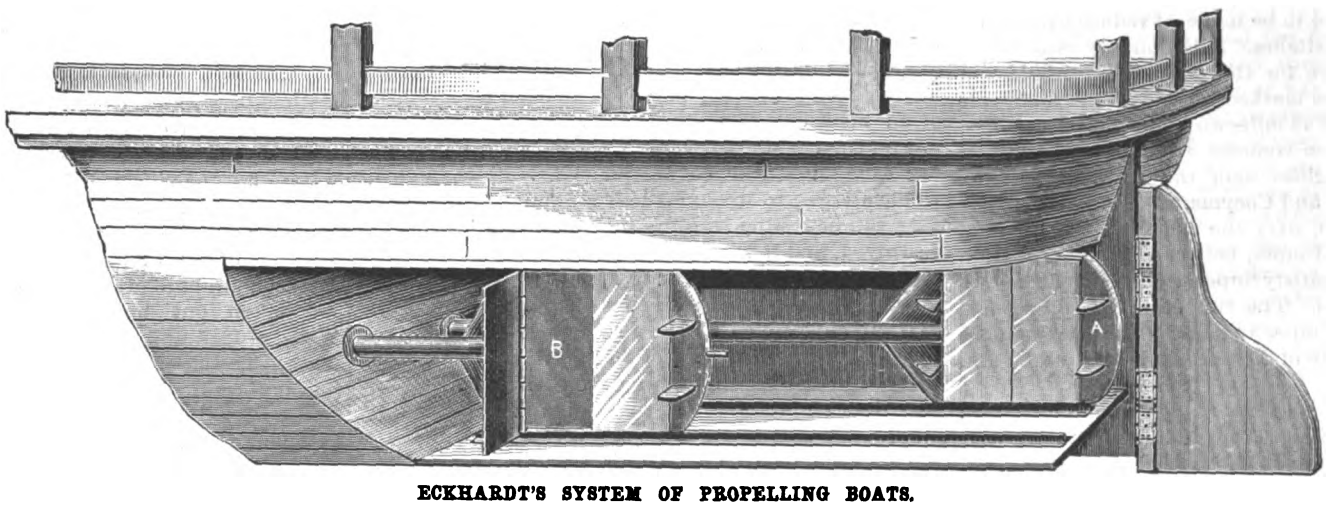
GALLAWAY'S OIL FILTER.

Ballooning with Natural Gas.

The first balloon inflated with natural gas ever sent up arose from Riverside Park, near Anderson, Ind., August 14. It has been a question as to whether or not natural gas would float a balloon to any considerable height, says a writer from that town. This one was filled from a pipe from a well until the gauge indicated that the silk, which was inclosed in a strong netting, was bearing twenty pounds pressure, when George Ayers, an amateur aeronaut, climbed into the basket, and the balloon was cut loose. It rose steadily until an altitude of about 2,500 feet was reached, when a current of air was struck which bore the balloon and its single passenger away to the southeast, since when nothing has been seen or heard from him.—*Progressive Age.*

A NEW METHOD OF BOAT PROPULSION.

The system of propelling boats herewith illustrated has been devised by Mr. J. Eckhardt, corner of 25th and Palm Streets, St. Louis, Mo. Four cylinders, each connected with an engine in the vessel, are mounted to be reciprocated through a waterproof packing in recesses made below the water line in each side of the hull, and extending a short distance forward from the stern. There are two of these cylinders on each side of the vessel, and on their outer ends are up and down flanges, on which vertical steel paddles are hinged, one on each cylinder for forward and one for backward movement. The cylinders are each coupled to a crosshead running on slides in a horizontal direction the full length of the stroke, the connection being such that with every revolution of the driving shaft the two outside cylinders, with square open paddles, pass out, while the other two cylinders, with closed paddles, pass in, and *vice versa*. There is a rod in each cylinder, by which the paddles may be reversed as desired, without stopping the engine, whereby the vessel may be turned in about its own length.



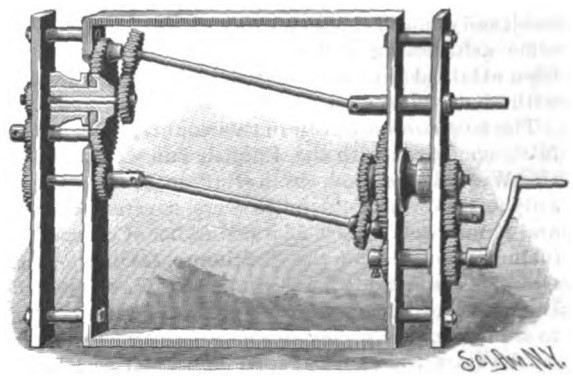
ECKHARDT'S SYSTEM OF PROPELLING BOATS.

Frieze from Susa.

The frieze of the archers of the guard which M. and Mme. Dieulafoy brought from Susa is composed of bricks 14 inches by 7 and 9 inches thick. They were cast in moulds, and perhaps worked on while still moist. The glaze on their faces has not always held, and it was necessary to subject them to treatment, or they would never have reached Europe. The frieze once decorated a wall in a side porch of the throne room of the palace of Darius. A correspondent of the *Athenæum* writes: "The warriors are portrayed marching in single file, each holding a spear, as in the attitude of 'attention,' and having large quivers slung at their backs, and their bows at their left arms. Their close-fitting helmets are bound round with a roll of green linen. They wear tunics reaching to the ankles, also an inner garment with long sleeves, and laced shoes. The color of the dresses varies, a white tunic and yellow underdress alternating with a yellow tunic and manganese purple underdress. The tunics are elaborately ornamented, the point of special interest being that the white tunics are sprinkled with a design representing a castle (the citadel of Susa?), the triangular battlemented towers being yellow on a purple ground. The guards wear gold earrings and bracelets. They are brown-skinned. Their curled black beards, bush of black hair pushing out below the helmet, and strongly accentuated features combine to form an appearance singularly resolute and martial."

AN IMPROVED GEARING FOR TRANSMITTING MOTION.

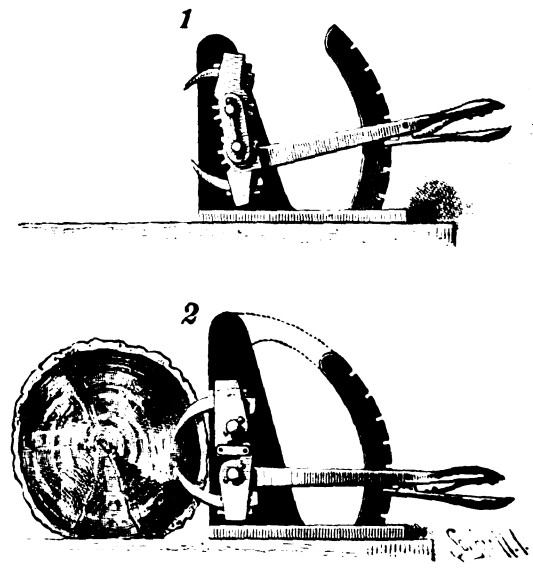
In the gearing herewith illustrated, which has been patented by Mr. Ole O. Kravik, of St. Carl, Dakota Ter., a short shaft, having on its outer end a crank arm, is mounted in a suitable frame, a gear wheel on the shaft and next to the crank meshing into an intermediate gear wheel mounted above on a stud, the latter wheel meshing into a higher gear wheel on a shaft rotating in the end standards, and carrying on its inner end a bevel gear wheel. The latter meshes into a bevel gear wheel secured to the lower shaft held in inclined position and secured at its outer end to another shaft mounted to rotate in suitable bearings. The inner end of the lower inclined shaft has its bearing in a lug secured to the face of a large gear wheel rotating loosely on the shaft carrying the higher gear wheel above the crank arm, this large gear wheel meshing in a gear wheel secured to the inner end of the shaft operated by the crank arm. A very rapid rotary motion can by this construction be given to the first or lower inclined shaft, to be used for driving suitable machinery, or the same arrangement, as shown to the right in the illustration, may be duplicated as represented in the standards to the left and the upper inclined shaft, giving proportionately accelerated speed to the operating shaft.



KRAVIK'S GEARING.

AN IMPROVED SAWMILL DOG.

The simple and effective device herewith shown, which has been patented by Mr. John B. McRae, of Mount Holly, Ark., has an upwardly projecting knee in the forward end of a suitable base, a segmental rack being attached to the opposite end, or cast integral therewith. Fig. 1 shows aligning blocks pivoted to one face of the knee, their contiguous surfaces having intermeshing teeth, and their outer ends being recessed to receive outwardly extending curved dogs, secured by keys. From the lower block extends a lever arm adapted to slide upon the side of the rack, and having at its handle end a spring latch adapted to engage the recesses of the rack. Fig. 2 shows a modified form of the device, in which the intermeshing teeth on the blocks are dispensed with, and the blocks have on their contiguous portions lugs, between which a link connection is formed.



McRAE'S SAWMILL DOG.

Fast Time on American Railroads.

The liveliest interest was manifested by railroad men in the recent account of the race between the "Flying Scotchman" and the "West Coast Flier" from London to Edinburgh, in which 400 miles were covered by the winner in 7 hours and 25 minutes. This was an average of something over 53½ miles an hour. There was a general jogging of memories and overhauling of the records of fast railroad trains on American lines. And much comfort was found by many in going over those records. For they show that, although the British and French roads admittedly make much better time habitually than is made on any of the American lines, some astonishing and sustained rates of speed have been attained here, when special efforts were expended with that end in view.

The best run on record in this country which can be fairly compared with the English run was made over the West Shore road, from Buffalo to New York, on July 9, 1885, when 426 miles were covered in 7 hours and 27 minutes. Quite a large number of railroad men, including officials of the Baltimore & Ohio, Wabash, Grand Trunk, and West Shore roads, happened at Buffalo together *en route* for New York. It was decided to see how quickly they could move over the new road. At the start the railroad men had their watches out, and soon the mile posts were flying past every 43 seconds. That speed was held so steadily that the greater part of the run was made at the rate of 45 seconds to the mile, or from 70 to 83 miles an hour. From East Buffalo to Genesee Junction, 61 miles, took 56 minutes; from East Buffalo to Newark, 93·4 miles, 97 minutes; from Alabama to Genesee Junction, 36·3 miles, 30 minutes. The 97 minutes to Newark included stops of 9 minutes, making the actual running time for the 93·4 miles, 88 minutes. From Newark to Frankfort, where the conditions for running were not so good as before, the run of 108·3 miles was made in 134 minutes, including 17 minutes for stops. From East Buffalo to Frankfort, 202 miles, the time was 240 minutes, of which 35 minutes were consumed in stops. There was only a single track at that time on the road a good part of the way between Buffalo and Syracuse, and that journey had to be made at reduced speed, especially over the switches. The journey was timed with the utmost care for the purpose of tabulation. In the table there are marked several miles which were made at the speed of 78 miles an hour, one at 84 miles, and the next, between Genesee Junction and Chili, at 87 miles. New engines took the train at Buffalo, Newark, Frankfort, and Coeymans.

On October 8, 1885, over the same road, a burst of speed was tried for 11 miles, between Genesee Junction and East Buffalo, to satisfy Superintendent J. E. Layng, who was on the train. The run occupied 512 seconds, an average rate of 74 miles an hour. Three of the miles were made at the rate of 80 miles an hour, 1 at 77, and 1 at 75.

On the New York Central road a newspaper train with two cars, weighing 60 tons, hauled into Syracuse, Sunday morning, August 8, 1886, at ten o'clock, an hour late. The train was booked to go from New York to Buffalo in 9½ hours. Orders came to try to make up the time on the further run of 148·7 miles to Buffalo. John W. Cool, one of the best engineers on the road, mounted his cab, bound to obey the order. He started out at 54½ miles an hour. At the end of the three miles his speed increased to 66 miles an hour, and then to 74½. He stopped at Rochester for water, and slowed up after passing Crittenden. His average speed from Syracuse to Rochester was 67¼ miles per hour, from Rochester to Buffalo 63·72 miles per hour, and from Syracuse to Buffalo 65·6 miles an hour. The run of 148·7 miles was made in 136 minutes.

The most remarkable long distance run on record was when the Jarrett-Palmer combination went from New York to San Francisco in half time, or 3½ days. Their train left the Pennsylvania station in Jersey City at 12:53 on the morning of June 1, 1876. They were not to make a stop until they reached Pittsburg. An engine and bagage car, on the approach of the special to Harrisburg, got up a speed of abont 50 miles and passed mails to the special by running along an adjoining track for several miles, while the mail bags were thrown from train to train. The run to Pittsburg, 438½ miles, took 10 hours and 5 minutes, an average of 43½ miles an hour, notwithstanding the Alleghanies. From Pittsburg to Chicago, 458·3 miles, took 11 hours and 6 minutes, an average of 42·1 miles, including 25 stops and 4 changes of engines. From Chicago to Council Bluffs, 491 miles, took 11½ hours, an average of 42·6 miles, although there was a record for part of this journey of 62·2 miles. Over the Union Pacific the run of 1,032·8 miles from Omaha to Ogden was made in 24 hours and 14 minutes, at an average of 41 miles and a maximum of 72 miles an hour. The brakes became worn at Ogden and hand brakes had to be used, retarding the onward journey somewhat, as the men feared they might lose control of the train. San Francisco was safely reached at 12:57 on June 4, quite in time for the dinner that had been ordered for the company for that day. The last stage of the journey was run at an average of 37 miles. During the entire run 20 engines were used, there were 72 stops, and the running time for 3,313½ miles was 84 hours 17 minutes, an average of 40 miles an hour.

On the Pennsylvania road 45 miles an hour is not uncommon, and there are level stretches where a speed of a mile a minute is attained. Samuel Carpenter, the general agent of the road for this city, said recently, that if there was any need of making time to compare with the new English schedule, it could be done. On the New York Central road the run of 80 miles from Rochester to Syracuse has been made in 80 minutes when it was necessary to make up lost time. Assistant Superintendent Voorhees, of the New York Central, said that he stood ready any day to send a party from New York to Buffalo, 440 miles over that road, in the same time made by the English racer for 400 miles, if the party would pay $2 a mile to get there in 7 hours and 25 minutes.—*N. Y. Times.*

Milk for Infants.

BY FREDERIC M. WARNER, M.D., VISITING PHYSICIAN TO OUTDOOR DEPARTMENT OF BELLEVUE HOSPITAL (DISEASES OF CHILDREN), NEW YORK.

A problem which occurs to every general practitioner to solve, with greater or less frequency, is the successful rearing of children which have been, from some cause or other, deprived of the maternal nourishment; to this end various foods have been devised—some good, others bad, and all expensive.

After experimentation with, and trial of, most of these, I have come back to cow's milk, properly prepared, as the best substitute at our command.

This summer the bottle-fed children under my care have, with the exception of an occasional slight diarrhœa, done uniformly well, and this has tested, to my complete satisfaction, the method employed to render their food digestible and aseptic.

Since the publication of Dr. Jeffries' * interesting article, I have caused the milk consumed by all my artificially reared children to be prepared in the following manner: Into an ordinary cooking steamer, which can be bought at any hardware store, a couple of inches of water is put and brought to the boiling point; the milk which is the infant's allowance for the next twenty-four hours is placed in as many nursing bottles as are used during that length of time. These bottles, having been previously placed in an oven for a quarter of an hour, are now stoppered with cotton-wool, and put on the perforated plate in the steamer, not touching each other, the cover shut tightly down, and the whole allowed to steam for half an hour.

As will be readily seen, by this method all germs are destroyed, and if the milk is left stoppered and in a cool place, it will keep a long time. In the course of some experiments which I have been making, I find that, to-day, milk which was steamed exactly five weeks ago is perfectly sweet and good.

When feeding time comes, the woolen cork is removed and lime water and sugar of milk are added. A nipple taken out of boiling water is put on, the bottle warmed, and the child's food is ready for administration.

Until six weeks old the proportions of lime water and milk are half and half, with a teaspoonful of sugar of milk. About three ounces of this mixture will be taken every two hours; from six weeks to three months, one-third lime water, and from this time gradually diminish the amount. I prefer using the ordinary cooking steamer to the somewhat elaborate and costly apparatus of Soxhle tfor the sterilization of milk, for the reason that it is inexpensive, easily kept clean, and does not bewilder the overtaxed mother or nurse with elaboration of detail.

In closing, I wish merely to emphasize the fact that a bottle must be used but once; immediately after the child has nursed all it will, the remainder of its contents must be thrown away, the bottle washed, and placed in the sun and air.—*Medical Record.*

Inoculation for Cholera.

Dr. Gamaleia, of Odessa, who has studied the prophylaxis of hydrophobia in Paris under M. Pasteur, and under whose direction several institutions for the treatment of that disease have been founded in Russia, has communicated to the Paris Academy of Sciences (through M. Pasteur) a paper on the cure of cholera by inoculation. The procedure is similar to that adopted by M. Pasteur in hydrophobia, and experiments with the choleraic virus upon animals have been successful. As M. Pasteur himself has apparently concurred in the value of the results obtained by Dr. Gamaleia, the procedure in question may be assumed to be more firmly supported by rigid scientific facts than were the inoculations with which a few years ago Dr. Ferran's name was associated. It will be remembered that, although Dr. Ferran averred that his method was based on Pasteurian principles, M. Pasteur himself did not concur in his practice, nor had any practical result followed from the investigations pursued in Egypt by the French commission, one of whose members, Dr. Thuillier, lost his life from cholera during the inquiry. Moreover, in course of time it was abundantly proved that Ferran's inoculations were untrustworthy. Dr. Gamaleia's method is based on his discovery that pigeons inoculated with the blood of guinea pigs which have been inoculated with cholera virus die from "dry cholera," with detachment of the intestinal mucosa, and that, moreover, the virus which has thus passed through the pigeon gains in intensity, so that it will kill pigeons in from eight to ten hours, and even destroy guinea pigs. But when a pigeon was inoculated with the uncultured virus in the breast and in the abdomen, it became refractory to the cultivated virus of the highest intensity of virulence. By heating the culture broth to 120° C., and inoculating pigeons on successive days with small quantities, they became refractory to cholera. "The vaccine is sure and inoffensive when given in small doses and successively, and it is to be hoped that whole populations may be saved by this method from Asiatic cholera." The *Times* correspondent (August 21), in forwarding an abstract of Dr. Gamaleia's paper, adds the following interesting details: "M. Pasteur, after reading the note, stated that Dr. Gamaleia had expressed his readiness to repeat the experiments at Paris, in presence of a committee of the Academy of Sciences, and to try on himself the inoffensive and sufficient dose for human vac ination. He is ready to undertake a journey into countries where cholera prevails to prove the efficacy of his method. M. Pasteur added that he need scarcely say that he accepted, with the greatest satisfaction, the offers to conduct the experiments in his laboratory made by Dr. Gamaleia. The letter was referred to the committee, which has a prize of 100,000f. in its hands for a cure for cholera, and it was arranged that the experiments should be postponed till November." It will be interesting to hear what Professor Koch has to say upon these experiments, and the sanguine anticipations based on them.—*Lancet.*

* *American Journal of the Medical Sciences*, May, 1888.

Induration of Stone.

The rendering soft stones hard, and the protecting the surfaces from the weather when worked and set, has been the subject of great investigation. A. Ashpitel, in the *Architect* (London), says:

The idea of the latter seems to have originated with the late well known John Sylvester, who tried the method of washing over the faces of stone walls with first a solution of soap and then of alum. Another method was that of washing with what was called water glass, or silicate of potash, both of which are said to have failed. The next idea was to soak the stone, or in some way to cause the surface to imbibe a quantity of oily or fatty matter, to throw off the wet, as well as to harden the stone itself. The first patent was taken out by Mr. Hutchison, at Tunbridge Wells, in 1847, and was applied to the new sandstone there. The stones, when worked, were boiled in a solution of resin, turpentine, wax, oil, etc., and sometimes, we believe, pitch, till they were impregnated a sufficient depth from the surface.

In 1851 Mr. Barrett took out a patent something like the preceding, but far more elaborate. The main elements, however, were resins, fats, and tallows, some of which were mixed with gutta percha, unslaked lime, copperas, and a number of other ingredients. In April, 1856, Mr. Daines took out a patent, not so much to indurate stone, but to preserve stone or cement walls from damp and efflorescence. His process was to apply, first, a solution of sulphate of zinc, or solution of alum, to the wall, and then a composition of sulphur dissolved in oil. In the same year, and in the next month, Mr. Page took out a patent for a similar purpose. His material was wax dissolved in coal tar, naphtha, or, for more delicate work, in camphine.

Mr. Ransome's process was deduced from his experiments on the artificial stone. It consists of treating the surface of the stone, first, with a solution of silicate of potash or soda, and then with a solution of the chloride of barium, or chloride of calcium, by which means an insoluble silicate, either of barium or lime, is deposited in the pores of stone. The most extraordinary results, however, are promised by Mr. Szerelmey's process. It will not only entirely protect the surface of stone or brick or cement, but of iron. As a proof, an anchor coated with it was sunk in the sea for many months, and raised again without trace of oxidation.

Clearing Negatives.

Sometimes by prolonged development negatives become stained, and usually clearing solutions are employed after the negative is fixed.

Mr. T. Bedding, in the *British Journal of Photography*, advises the use of an alum and citric acid bath, one part of citric acid to thirty of alum; before fixing. When the developer has been poured off the negative, the latter should be washed in a couple of changes of water, and the clearing solution applied for a few minutes, after which it may be returned to the bottle for future use. It is then important that the negative be carefully washed prior to immersion in the fixing bath.

Correspondence.

Fast Trains.

To the Editor of the Scientific American:

By some oversight, your article in last issue on "Speed of Passenger Trains" makes no reference to the three fastest trains which are scheduled in the *Travelers' Official Guide.* The Pennsylvania and Philadelphia & Reading railroads each have a train which leaves Philadelphia at 7:30 A. M. and arrives at New York exactly two hours later. Including ferries and stops, this shows an average speed exceeding 45 miles per hour for each train. The Pennsylvania R.R. train makes one stop *en route* to Jersey City, and the Reading train four stops (including one for change of engines), and as the distance traveled by each is within a fraction of 90 miles, it would show that the Reading train is the faster. Omitting the 7 minutes consumed in crossing the one mile of ferry, it makes an average speed of 47·4 miles per hour, including stops. While traveling on this train, I have timed a mile in 48 seconds (a rate of 75 miles per hour), and either train will usually run several miles at the rate of 67 miles per hour or better every trip. The Baltimore & Ohio R.R. has a train scheduled for the comparatively short run between Baltimore and Washington at the rate of 53 miles per hour. G. H. S.

Franklin, Pa., September 11, 1888.

Hemlock Lumber and Bark.

To the Editor of the Scientific American:

In your issue of the 15th inst. you publish an article on "Hemlock Lumber and Bark," written by Jackson S. Schultz, and copied from the *Shoe and Leather Reporter*, which contains much that is true and interesting, yet some things which are erroneous and misleading. What he says of the use of hemlock timber is, in the main, true; and he might have added that it is superior to pine and spruce for frames where other work must be fastened to it with nails, as it is well known that it will hold nails equal to any other known, so called, soft wood. In addition, it is equally as fine grained and suitable for interior oil finish as the popular Georgia pine.

But he errs when he says its use for railroad ties is prevented mainly because it does not hold spikes as well as oak and chestnut. It will hold a spike as well as chestnut, and a hemlock is as good as a chestnut tie as long as it is sound. The trouble is it will not last when exposed. Five years is about as long as you can depend on hemlock when used for ties, trestles, or other exposed structures, while the average life of oak and chestnut in like situations is about ten years. Mr. Schultz must be misinformed of the length of time—eighteen years—that hemlock ties have lasted in the railroad named. I do not believe a hemlock tie, without artificial preparation, ever did fairly safe service for eight years when placed in the roadbed of an American railroad.

Mr. Schultz is far from the facts when he states that "the counties of Elk, McKeon, Sullivan, Warren, and Forest are substantially intact." Of course he is not supposed to be personally acquainted with the actual state of affairs. Not all the forests are hemlock. There are large tracts known as beech, maple, or chestnut ridges, where scarcely a hemlock tree can be found. In addition, the lumberman's ax, followed, as it almost invariably is, by fire, has ruined thousands and thousands of acres.

The immense tanning establishments in Sullivan, Lycoming, Tioga—in which is located the largest one in the world, owned by Hoyt Brothers—Potter, McKeon, Elk, Forest, Cameron, and Warren, show what is being done to the hemlock forests of northern Pennsylvania. Mr. Schultz certainly cannot mean that the present supply can be kept up for any great length of time. It must not be expected when such destruction is going on. Already bark is being hauled eight or ten miles by teams to supply the various establishments.

The prices named by him—$5 and $6 per cord or ton of 2,200 pounds—do not, as a rule, prevail. The insane desire of the lumberman to cut down every tree he can reach has had its legitimate effect, and the average price is from $4 to $5 instead. Probably more is purchased at $4.50 and under than otherwise. Let twenty years roll by, and we shall see a much altered state of affairs. Considerable hemlock timber land has been purchased by the heavy operators, but those who shall not own their own bark will, in the near future, pay all that Mr. Schultz names, and more too.

The child Mr. Schultz mentions will not necessarily have to reach fourscore years of age to see a greatly lessened supply of hemlock bark; and before he shall be one-half that age he will have seen the decay and abandonment of a large portion of the existing establishments without a corresponding increase of new ones. S. B. ELLIOTT.

Du Bois, Pa., Sept. 18, 1888.

FRESH meat beginning to sour will sweeten if placed out of doors in the air over night.

The Panama Rocks.

BY H. C. HOVEY.

The Devonian rocks of Pennsylvania and western New York are topped by five distinct conglomerate formations. The oldest of the five is in the Upper Chemung group, and its southernmost exposure is in a charming little valley, through which meanders the Brokenstraw Creek, a tributary of the Alleghany River. From its location near the village of Panama, in Chautauqua County, N. Y., it is called the Panama conglomerate, and its typical ridge is known as the Panama Rocks, and has for many years attracted the attention of the inhabitants of the region. Professor Starr called my own attention to it during a recent outing at Lake Chautauqua, and with a party of explorers we visited the place. The owner is Mr. G. W. Hubbard, who has expended a considerable sum in opening the grounds, without in any respect impairing their natural wildness, so that all parts are readily accessible to visitors, of whom, as he informed me, there have been more than 10,000 this year, coming from nearly every State in the Union, as well as from other lands.

On examining the ridge, we found that it is underlaid by a bed of arenaceous shale, that has been much eroded by the water soaking through the conglomerate. As the shale gave way, the superincumbent conglomerate broke by natural jointage into square masses, which were left to slip apart, leaving spaces between the huge blocks. The general appearance may be imagined from the local term of "Rock City," which is certainly very appropriate. We were told that there were a number of such rock cities in the region, and that some of those in Cattaraugus County and in Alleghany County were quite as remarkable as the Panama Rocks.

The impression left with almost every visitor is that these rocks have been thrown to the surface by some subterranean force. And yet, any one who has ever visited the canons of Colorado or Ausable Chasm, N. Y., or the caverns of Kentucky, can testify that rocks of equal magnitude may be tossed about in an extraordinary manner by simple erosion and undermining. The Brokenstraw Valley, a mile wide, has doubtless known a mightier flood than the little mill stream that now winds through its channel. This is proved by the conglomerate itself, which is a peculiar mass of tiny white quartz pebbles, each pebble being a true oval, and all of them, as they repose in the strata, being pointed in the same direction. These were, of course, parts of larger fragments detached from primitive ledges, and subjected to long continued attrition and polishing by flowing water, until, in time, heavy beds of uniformly fine gravel were formed overlying beds of sandy mud. They were then cemented together by a calcareous deposit, and were finally broken into blocks by the washing out of the shale underneath. These blocks present perpendicular faces varying from twenty to sixty feet in height, and about the same in breadth.

The fissures between them reach from top to bottom, generally giving room for a narrow pathway. In several instances the summits were in contact while the bases were spread apart, thus forming caverns of considerable size. One of these is called "The Counterfeiters' Den," because actually resorted to as a hiding place by certain manufacturers of spurious bills and coins, who are now serving their time in prison for their misdeeds. Various fanciful names have been given to other grottoes. The "Ice Cave" is a cleft in whose deep recesses the snow is drifted in winter in such quantities as to remain through the summer, not melting till autumn. Inquiry satisfied me that this phenomenon has nothing in common with those mysterious freezing wells and ice grottoes whose waters freeze in summer and thaw in winter. Indeed, the conditions are totally unlike, and the ice cave of Panama may be set down as merely a natural ice house, and, as such, a remarkable curiosity.

By a descent called "The Natural Stairs," a fissure is reached that may be entered from the summit, followed for a long distance between rocks forty feet high, and under a rocky roof until the winding tunnel opens at the foot of the rocks. Those who persist in regarding the whole ridge as the result of upheaval rather than subsidence called my attention to the fact that the stratified conglomerate, after running in a uniform direction for a considerable distance through this fissure, suddenly changes to an obtuse angle. But this tilting might have been due to the disturbance caused by the erosion of the underlying shale, which could hardly have gone on at an equal rate everywhere.

There is abundant evidence of the powerful action of huge volumes of water at some former period. The surfaces of the conglomerate masses are frequently polished, so as to make it necessary for one to be somewhat careful in walking over them, lest a slip should be followed by a fall. The corners are nicely rounded, as if by running water; and to the same cause may be ascribed the numerous round pockets worn in the face of the rocks.

"Cradle Rock" rests on a ledge a little below the top of one of the many precipices, weighs several tons, and yet is so delicately balanced that the weight of a person stepping upon it will cause it to rock to and fro, as if about to topple over into the chasm below. Yet the danger is imaginary, and probably nothing less than a charge of dynamite would dislodge the stone from the shelf on which it rests.

Although the surrounding region is under cultivation, the original forest has never been removed from the Panama Rocks, and the grand old trees so completely hide this remarkable formation that one might ride through the valley below without suspecting what a romantic region was thus concealed. Indeed, it is not easy to explain such a luxuriant growth of forest trees where there is so little soil to support plant life. I noticed particularly a large pine growing on the summit of an isolated mass of rock, the surface of which was nearly bare, while the perpendicular sides were fully forty feet high. Large birches cling to the sides, whose enormous roots rival the trunks in size, and run down in fantastic spirals to reach the rich soil covering the floor of the various fissures. On one large rocky fragment we noticed two great trees, one at each end of the rock, whose spreading roots had completely enwrapped it, some of them being at least thirty feet long. These are but specimens of the hundreds of trees that grow here in a manner almost aerial, and wholly unlike anything I should look for among the sober, steady old trees of this temperate zone.

In conclusion let me suggest the propriety of having this extraordinary region, which after all covers only a few acres, secured as a State park. Its present owner (as has been already stated) takes pride in keeping it in its primitive condition, except as it has been necessary to do a little clearing in order to make its intricate passages accessible. But the place is sought by speculators to whom it might not be safe to trust such a peculiar treasure of nature. The time has come for the State to get possession of all such places, which are not only attractive as resorts for tourists, but are also richly instructive in both botanical and geological science.

The End of the Great Eastern.

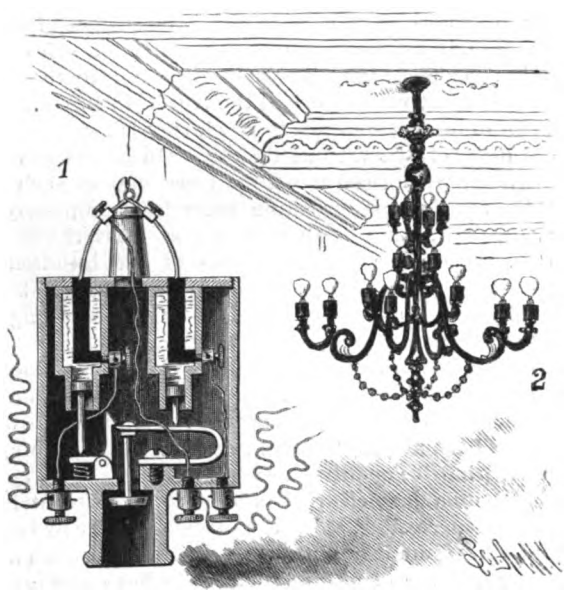
Although there are still some persons who believe—and perhaps the wish is father to the thought—that this great vessel, designed by Brunel, will not come to such an inglorious end, there is very little doubt that she will be broken up, and her fragments sold as old iron. After having passed through so many vicissitudes for the thirty years of her existence, the Great Eastern was successfully beached near New Ferry, on the Cheshire shore of the Mersey, on August 25. The previous Wednesday at noon she was got under way, and started from the Clyde on her last voyage. With her own steam she could make a speed of between 4 and 5 knots, but she was also towed by the powerful tug Stormcock. The weather was bright when the vessel started, but next morning the wind freshened, while dark masses of clouds presaged the bad weather that followed. The gale was at its highest when the vessels were off the Isle of Man, about six o'clock on Thursday evening. The tug cast loose the hawser, which seemed an impediment to navigation, and while the engines of the big ship were stopped for a while, she became practically unmanageable, the gale having full play against her hull, which was very high out of the water. For four hours she was rolled about at the mercy of the seas. Heavy goods on board were dashed about below, while the funnels swayed as if about to be dislodged. Notwithstanding that she stood 40 feet out of the water, some of the seas swept over her, and a large gangway was torn from its chains and carried away. At length she was got to windward, and the course directed to the Irish coast; but the gale moderated, and on Friday morning the Stormcock, which had kept near, resumed the towing of the ship, which reached the bar of the Mersey at five o'clock on Friday evening. There may be many who, but for the loss of life it would have involved, would have been glad to hear that the Great Eastern had foundered in the last gale she rode through, rather than that she should undergo the last indignities of a breaking up. After all, however, many a valiant battle-ship, with a large roll of honor, has shared the same fate. *Sic transit gloria mundi.—Iron.*

Glass Cloth.

Mr. Dubus Bonnet, of Lille, France, has invented a process of spinning and weaving glass into cloth. The warp is composed of silk, forming the body and groundwork, on which the pattern in glass appears, as effected by the weft. The requisite flexibility of glass thread for manufacturing purposes is to be ascribed to its extreme fineness, as not less than from 50 to 60 of the original strands are required to form one thread of the weft. The process is slow, for no more than a yard of cloth can be produced in twelve hours. The work, however, is extremely beautiful and comparatively cheap. A French paper, commenting on the discovery, says: "When we figure to ourselves an apartment decorated with cloth of glass and resplendent with light, we must be convinced that it will equal in brilliancy all that the imagination can conceive and realize; in a word, the wonders of the enchanted palaces mentioned in the Arabian tales."

AN ELECTRICAL GAS LIGHTER AND EXTINGUISHER.

A device in which the turning on and shutting off of gas flowing to a burner is effected by the heating action of an electrical current, and in which the gas will be ignited by an incandescent wire, is illustrated herewith, and has been patented by Mr. George L. Hogan. In combination with a gas burner is a casing which has a collar fitting on the supply pipe, two cylinders filled with mercury being mounted in the casing, the lower ends of the cylinders being of reduced size, and provided with pistons having downwardly extending rods, as show in the sectional view, Fig 1. One of these pis-



HOGAN'S GAS LIGHTER AND EXTINGUISHER.

ton rods rests on the free end of a U-shaped spring, to which is attached a valve rod passing to a valve in the supply pipe, the free end of the spring, when pressed down sufficiently to open the valve, being caught by one arm of a right-angled spring catch lever, on the other arm of which rests the piston rod of the other cylinder. Three conductors are required to operate the burner. To turn on the gas, the current is sent through the right hand mercury cylinder, by means of an electrically insulated conductor surrounded by heat conducting material, whereby the expansion of the mercury will press the piston down and open the valve in the supply pipe, the end of the spring which presses on the valve rod being then caught and held by the catch lever. A looped platinum wire is supported in the circuit near the tip of the burner, and is sufficiently heated by the current to ignite the gas. To extinguish the gas the current is sent by the left hand wire through the other mercury cylinder, the expansion of the mercury pressing down its piston and releasing the catch lever by which the valve in the supply pipe is held open, the circuit being completed by the middle conducting wire rather than by the circuit of greater resistance through the platinum coil.

For further information relative to this invention address Messrs. Conway, Kelly & Co., of Lebanon, Ky.

Hydrocarbons and Rock Salt in Nature.

The frequent association of salt and bitumen or petroleum in the same deposits has often struck me as likely to lead to the development of some probable theory as to the formation of these hydrocarbons. Almost all specimens of rock salt, when struck or rubbed, give off more or less the characteristic odor of bitumen. Beds of rock salt are often colored brown by the bitumen they contain, and petroleum, on its emergence, is nearly always associated with brine. Deposits of rock salt are, as a rule, dry and anhydrous, though salt itself has a considerable attraction for moisture. But more than this, those salts of potassium and magnesium often occurring with it are still more greedy of water.

If the seemingly probable theory that all formations of rock salt are due to the evaporation of sea water be correct, then these deliquescent and hygrometric chlorides would almost always have been the last part deposited in every bed of rock salt; and though, owing to their great solubility, they may have been denuded and washed or melted away perhaps long afterward, it is probable that they generally formed the final layer at first. These would, by their affinity for water, both during their formation and subsequently, tend to withdraw that liquid from all surrounding substances.

Now most organic matter may be looked upon as a hydrocarbon combined with the elements of water. Withdraw the water, and the hydrocarbon remains. Metallic iron, if present, might modify the reaction. Is it not, then, a probable theory that most natural deposits of hydrocarbons owe their origin to this absorption of water, acting through the lapse of ages on organic matter, often aided by heat and pressure? If such be admitted, it would account for the frequent association of salt with hydrocarbons.—*F. Maxwell Lyte, F.C.S., in Chem. News.*

THE WATERHOUSE INSTANTANEOUS REGULATOR.

The Waterhouse Electric and Manufacturing Company, of Hartford, Conn., has established a large business on the basis of a system of electric illumination including a new dynamo, a new type of arc lamp, and an automatic current regulator, which is sufficiently quick in its action to completely control the current, so that a full complement of lamps or only a single lamp may be placed in the circuit, as circumstances may require, the automatic regulator adapting the current to the load, so that the current is always proportionate to the number of lamps in the circuit. This system of automatic regulation effects a great saving in power, and insures uniformity in the light.

The dynamo shown in perspective in Fig. 1, and diagrammatically in Fig. 2, has a closed circuit armature and is provided with three commutator brushes, *a*, *b*, *c*. The brushes, *a*, *b*, are arranged at diametrically opposite points on the commutator cylinder, the brush, *a*, being connected with the field magnet conductor, and the brush, *b*, with the outside circuit. The third brush, *c*, is arranged in advance of the brush, *a*, and is connected with one end of the resistance, R, the opposite end being connected with the remaining terminal of the field magnet. The resistance is made variable by the slide, which is controlled by the solenoid in the outside circuit. The current passes from the resistance to the outside circuit conductor through the slide. The brushes, *a*, *b*, *c*, are supported in a fixed position, the brushes, *a*, *b*, being arranged at the point of maximum commutation for the normal current.

It will be observed that by this arrangement the current passes from the armature to the outside conductor through the brush, *c*, and resistance, R, directly and indirectly from the brush, *a*, through the conductor of the field magnet and resistance, R. The sum of the currents passing over these two paths will

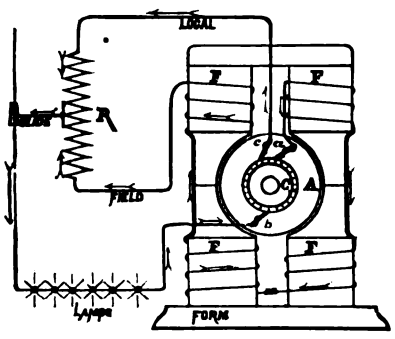


Fig. 2.—WATERHOUSE REGULATOR.

equal that used in the outside circuit, the current varying in the local and field circuits according to the position of the slide on the resistance and the resistance of the outside circuit.

By this arrangement, when the resistance of the outside circuit is decreased, the point of maximum commutation is carried forward toward the brush, *c*, and the current passing around the field magnet is diminished, thus reducing the pressure in the circuit, so that less power is required to drive the dynamo, at the same time a constant current is maintained on the lamp circuit.

The Waterhouse regulator varies the electromotive force directly with the resistance of the outside circuit, maintaining the standard current on the lamp line by balancing the field circuit and the outside circuit. This system, which is the invention of Mr. A. G. Waterhouse, is now lighting a large portion of the Centennial Exhibition at Cincinnati, Ohio. The plant consists of 240 arc lamps and a corresponding number of dynamos.

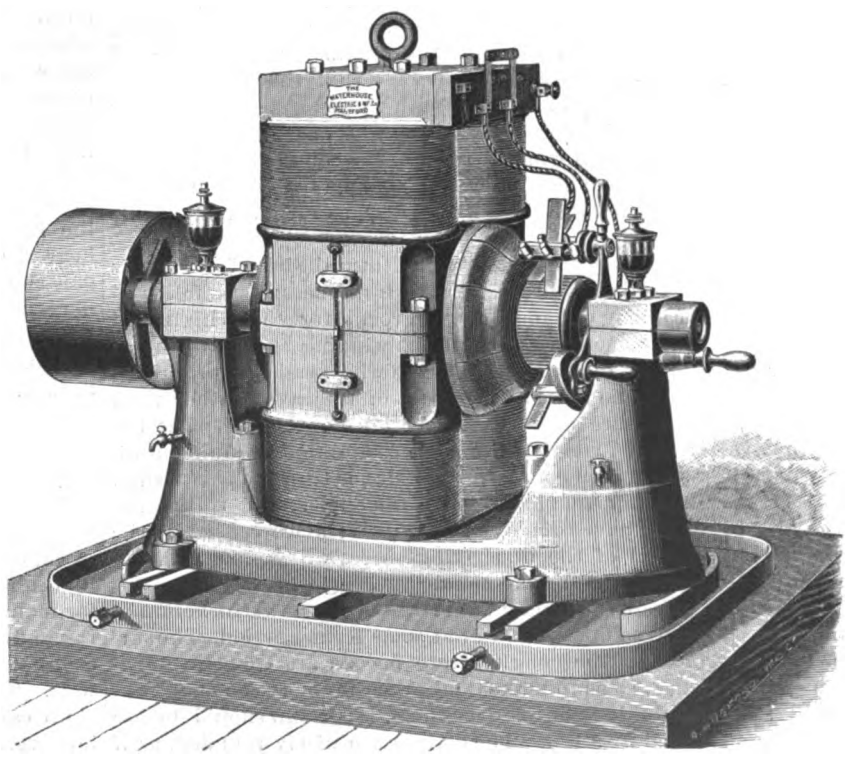
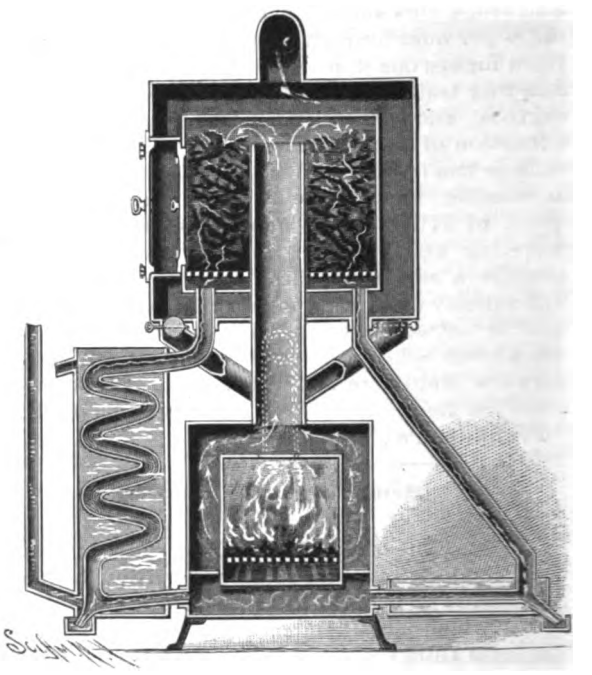


Fig. 1.—THE WATERHOUSE DYNAMO.

AN IMPROVED CHARCOAL BURNER.

A novel description of oven for burning charcoal in a chamber separated from the fire chamber, designed



SCHERFFIUS' CHARCOAL BURNING APPARATUS.

to continuously use the heated air, while gathering and condensing the products given off by the wood during the processes of charring, is illustrated herewith, and has been patented by Mr. Jacob Scherffius, of Winona, Minn. The fire chamber is surrounded by an inclosing case, and above the fire box is a box-like structure, with grates to receive the wood to be charred, a pipe leading from the chamber around the fire box nearly to the top of the charring oven, the latter having a jacket that is connected with the outlet of the fire-box by two or more pipes, with dampers, whereby the direct products of combustion pass through partitions in the jacket around the charring oven to the smoke pipe. A branch smoke pipe is connected with the fire box, whereby the products of combustion may pass off outside the jacket. The charring oven has two or more bottom outlets, to which pipes are connected by slip joints, these pipes on either side leading through water troughs, and being connected to the lower portion of the inclosing jacket of the fire chamber, in order that all moisture and other products driven off from the wood in charring may be condensed, and all cool air from the outside be prevented from entering the charring chamber. The discharge nozzles from the pipes leading through the water troughs on either lower corner dip within tanks, whereby a seal is formed preventing the admission of outside air. In commencing the charring process, the dampers are at first arranged to conduct the products of combustion outside of the jacket of the charring oven, and the pipes leading to it from the jacket around the fire box are disconnected, whereby the moisture first driven off from the wood will be expelled and pass to the outer air.

Chinese Have No Nerves.

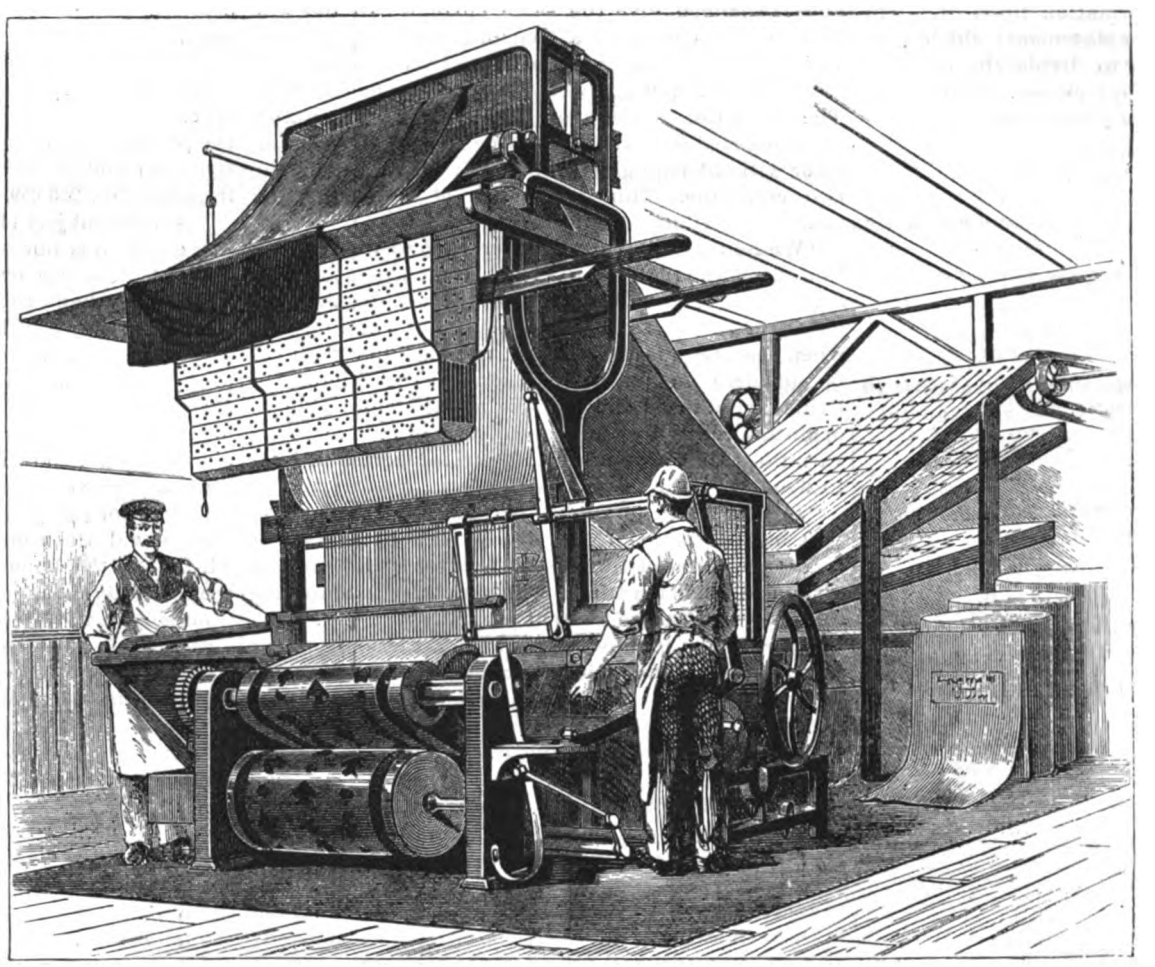
The North China *Herald* says the quality of "nervelessness" distinguishes the Chinaman from the European. The Chinaman can write all day, work all day, stand in one position all day, weave, beat gold, carve ivory, do infinitely tedious jobs for ever and ever, and discover no more signs of weariness and irritation than if he were a machine. This quality appears early in life. There are no restless, naughty boys in China. They are all appallingly good, and will plod away in school without recesses or recreation of any kind. The Chinaman can do without exercise. Sport or play seems to him so much waste labor. He can sleep anywhere—amid rattling machinery, deafening uproar, squalling children, and quarreling adults. He can sleep on the ground, on the floor, on a bed, on a chair, in any position. It would be easy to raise in China an army of a million men—nay, of ten millions—tested by competitive examination as to their capacity to go to sleep across three wheelbarrows, head downward like a spider, their mouths wide open and a fly inside.

THE GLASGOW EXHIBITION.

The International Exhibition at Glasgow, opened by the Prince and Princess of Wales on May 8, is the largest that has been held in the United Kingdom since the London International Exhibition of 1862. The buildings and grounds occupy sixty-six acres, in the Kelvin Grove Park, the main entrance, facing northeast, being nearly opposite the Glasgow University buildings, which are on Gilmore Hill, on the other side of the stream. From that direction the grounds are reached by a broad esplanade from a gateway in Bank Street, Hillhead; but the Exhibition Palace can be entered immediately either on its east side, in Gray Street, or from Sandyford Street, in the center of its south side. The building is 1,300 feet long and 265 feet wide, comprising a nave and transepts, with an iron dome 170 feet high and 80 feet in diameter, and with ten towers, which are 200 feet high, and are partly of brick. The remainder of the building is chiefly wooden.

It is in the Saracenic or Moorish style of architecture, with arches of horseshoe form, polygonal domes or cupolas, minarets and pinnacles, and appropriate decoration, painted internally with a rich cream color, relieved by deep red and rich dark brown, except the dome, which is painted red, blue, yellow, and green, and its framework apparently gilt.

The main avenue, from east to west, is more than a quarter of a mile long, 60 feet wide, and 43 feet high. The transepts, from the grand entrance to the south entrance, are 215 feet, and of the same width as the nave. The dome, rising from four substantial towers, is well proportioned. Its converging arches are adorned with the armorial bearings of Great Britain, France, Germany, the United States, Canada, Australia, South Africa, and India, and on circular panels below are four allegorical figures—Science, Art, Industry, and Agriculture. Scripture texts, speaking of the manifold works of God, and acknowledging that the manifold works of man are the gift of God, are inscribed over the four great arches under the dome. In the center is a fountain, with a circular promenade around it. A chandelier with eight electric lamps gives it light in the evening.



THE GLASGOW EXHIBITION—CARPET WEAVING.

At the east end of the main avenue is the grand hall, 200 feet long, 96 feet wide, and 60 feet high, with side galleries, an orchestra, and a fine organ, built by Messrs. J. W. Walker & Sons, of London. The decoration is in red and yellow, with festoons of red and blue cloth, fringed, heraldic shields and trophies, and canvas panels, filled with colored ornamentation of Moorish patterns. To the south of the grand hall is the Fine Arts Section; the Picture Gallery and the Sculpture Gallery occupying a substantial brick-walled part of the building, made fireproof, and which may be permanent. At the west end of the main avenue, beyond the principal building, and north of the line of its front, is the Machinery Annex, 330 feet long and 286 feet wide.

The buildings altogether cover a space of 474,000 square feet, of which 268,000 feet are devoted to general exhibits of the various classes (manufacturing and commercial and articles of produce), 27,500 feet to the Fine Arts, 16,000 feet to the grand hall, 23,000 feet to dining and refreshment rooms, and 140,000 feet to machinery, boiler sheds, and the like. Messrs. Campbell, Douglas & Sellars, architects, of Glasgow, and Mr. James Barr, C.E., furnished the design for these buildings. Messrs. W. Shaw & Sons, of Glasgow, were the contractors.

The different classes of articles in the Industrial Exhibition follow much the same order as that with which everybody is now familiar. For example, agriculture, mining and quarries, engineering, shipping, machinery, carriages, cutlery, chemistry, food and liquors, textile fabrics, paper and printing, furniture, pottery and glass, jewelry, clocks and watches, fisheries, education, and musical instruments, each subject with others allied to it. We give an illustration of carpet weaving, as shown in practical operation at the exhibition.—*Illustrated London News.*

A FEATURE of building construction at the present time is the extensive employment of enameled brick. These are used in places exposed to moisture, or where contaminating vapors are present in the air. The great superiority of such brick to painted brickwork in kitchens, laundries, courts, areaways, etc., is unquestionable.

THE GLASGOW EXHIBITION—VIEW FROM UNDER THE CENTRAL DOME.

Comparison between the British and French Navies.

Lord Wemyss has just issued an interesting and important document, in which a comparison is instituted between the British navy and the French navy. The papers have been drawn up by Sir Spencer Robinson, and one of the appendices has been annotated by Admiral Sir Thomas Symonds, whose interest in this subject is well known, and who has himself contributed to the dissemination of information upon it. The method adopted in the tabular statements which form the main part of the papers is to divide the *armored* fleets of either country into four classes. The results of this division may be generally summarized :

CLASS A.—*Ships universally considered fit for purposes of modern warfare at sea.*

ENGLAND.	FRANCE.
Types, Ajax, Devastation.	Type, Admiral Baudin.
27 ships.	22 ships.

CLASS B.—*Ships fit for coast defense, but not for sea.*

ENGLAND.	FRANCE.
Type, Glatton.	Type, Cocyte.
9 ships.	11 ships.

CLASS C.—*Fit for general service at sea, but obsolete in respect of power.*

ENGLAND.	FRANCE.
Type, Bellerophon.	Type, Marengo.
6 ships.	6 ships.

CLASS D.—*Unfit for war, but capable of being used for some purposes.*

ENGLAND.	FRANCE.
Type, Minotaur.	Type, Revanche.
13 ships.	8 ships.

The totals which result from this classification are :

England, 55 ships.	France, 47 ships.

The unarmored fleets of the respective countries are thus tabulated :

ENGLAND.		FRANCE.	
Speed in knots.	No. of vessels.	Speed in knots.	No. of vessels.
20	2	25	1
18—20	13	22	9
16—18	18	20	2
10—16	86	18—20	11
		16—18	7
		10—16	76
	119		116
Armored cruisers	12	Armored cruisers	5

The text of the memorandum contains a number of criticisms upon the existing naval administration. Some of the points, with added comments by Sir Thomas Symonds, are amply confirmed by the results of the naval maneuvers, as, for example, the criticism that a blockade is only effectual with a very superior force and a grand reserve. When one comes to compare the amount of protection afforded by the British navy to British commerce with that afforded by the French navy to French commerce, one arrives at the startling result that the proportion of war steamers to merchant steamers is in Great Britain 1 to 90, and in France 1 to 10. In the beginning of this century, the proportion in Great Britain was about 5 to 90 instead of 1. The conclusion of the whole matter is that Sir Spencer Robinson and Lord Wemyss recommended the addition to our navy of at least six battle ships (Admiral Symonds says eighteen), sixty first-class swift cruisers (Admiral Symonds says one hundred), a host of colliers, and an extension of electric cables. No estimate is given of the cost of these additions, but, for the smaller figures, it may be set down roughly at somewhere about $100,000,000 on the lowest estimate.—*Industries.*

Electric Light Patent.

United States Circuit Court, District of Massachusetts, in Thomson-Houston Electric Company *vs.* Citizens' Electric Light Company *et al.*, decided August 14, 1888. Holt, J.

This suit is brought for the infringement of letters patent No. 238,315, granted Elihu Thomson and Edwin J. Houston, March 1, 1881, for improvements in current regulators for dynamo-electric machines. The specification says :

"The object of our invention is to provide improved means for controlling automatically the strength of an electric current flowing over a circuit composed of a dynamo-electric machine and one or more electric lamps or other appliances, through which the current passes, and to obtain said control without the introduction of resistances as such, and without varying the speed or field of the dynamo-electric machine, and at the same time, if desired, to utilize the reaction principle for the magnetization of said dynamo-electric machine, or in other words, to cause the current generated to pass the field magnet coils. We accomplish these results at the same time that the power expended to drive the dynamo-electric machine varies directly in accordance with the changed resistance of its circuit, being less as the resistance is less, and greater as the resistance is greater. . . .

"In the improved system of operation provided by our present invention, we possess the ability to cut out lamp after lamp from circuit, and yet maintain a uniform current strength in the remaining lamps and economy of motive power proportional to the diminished resistance, while the normal light-giving power of each lamp not cut out is maintained, and an absence of heating or necessity for any other adjustments than those at the commutator of the machine obviated. These adjustments are preferably made automatic, for we find that with the commutator used by us, as herein specified, a proper adjustment of the commutator being effected when a certain resistance is in circuit, a similar adjustment will, when the resistance is changed, give the same current. In our system we have employed a dynamo-electric machine in which the commutator is constructed of three insulated segments of a ring connected to three armature coils. The collecting brushes applied to said commutator are supported so as to be movable around the commutator without changing the relative positions of the two collectors. This movement of the collecting brushes is well known in the art. . . .

"We find in practice, moreover, that we obtain with this automatic regulation of the current strength an independence of speed variations in the machine, it being only necessary to so adjust the speed of running that when the speed is at its lowest, the machine shall yet be sufficient in power to maintain the number of lights placed in its circuit. We are therefore able to operate successfully under conditions of motive power variations that have hitherto been recognized as fatal to steadiness of light obtained.

"In United States patent No. 223,659, January 20, 1880, before referred to, we have described a means of automatically adjusting the commutator collectors of dynamo-electric machines, which method is adaptable to the present case of current regulation. . . .

"Our present method of operating, therefore, so far as it relates to automatic regulation, is based upon the same principles of operation as our previous invention, and it consists in an improved construction and mode of use of the apparatus employed in patent No. 223,659.

"We claim :

"1. In a current regulator for a dynamo-electric machine, the combination of a device responding to changes in the main or generated current, a shifting commutator for said machine, and mechanism controlled by said responsive device to shift the commutator to those positions where the current taken up by said commutator shall be constant.

"2. In a current regulator for a dynamo-electric machine, an electro-magnetic device acted upon by variations in the main or generated current, an adjustable or shifting commutator for the machine, and mechanism controlled by said electro-magnetic device to adjust the commutator to those positions where the main or generated current taken up by said commutator shall be constant."

The main defense in this case is that the prior patent, No. 223,659, issued to these complainants, is an anticipation of the patent in suit. Upon careful examination of the two patents in connection with the testimony of experts and the able arguments of counsel, I cannot agree with the position taken by the defendants. The object of the two patents, as disclosed by their titles, is different.

The patent in suit is for a current regulator for dynamo machines, the earlier patent is for an automatic adjuster for commutator brushes on magneto-electric machines. Current regulation, or "to provide improved means for controlling automatically the strength of the electric current," is the object of the patent in suit, while the object of the prior patent was the construction of an automatic adjuster for commutator brushes, "whereby an automatic adaptation to variations of circuit resistance is secured, and the burning and destructive effects of false adjustments obviated." The design of the present patent is to adjust the commutator to those positions which shall keep the current constant, the design of the prior patent was to adjust the commutator so as to keep the current at its maximum value, or in other words, to adjust the brushes so that their contacts with the commutator segments should be at the neutral points, by which means the difficulty from sparking would be reduced to a minimum. It is true that the means employed in both patents to accomplish these different results bear a close relation to each other. The patentees declare that the earlier method described is adaptable to the present case of current regulation, but they also say that their present method consists in an improved construction and mode of use of the apparatus employed in the prior patent. To construct an automatic adjuster which shall avoid sparking or leakage by bringing the brushes in contact with the commutator segments at the neutral line, or the points of the maximum difference of potential between the segments, and, therefore, of maximum current, may be an important invention, but it is certainly quite a different invention to adjust the brushes of the commutator to positions which shall keep the current constant, independently of the question whether the brushes touch the segments at the neutral points, or whether sparking is avoided.

It is said that the present invention is shown in Figs. 1 or 2 of the earlier patent. The testimony of defendants' experts seems to find the invention described in Fig. 1, while the learned senior counsel for defendants appears to reject this contention and turns to Fig. 2 as an anticipation of the patent in suit. I do not find in Fig. 2 of the earlier patent the combination of mechanism which forms the subject matter of the claims of the patent now under consideration. I do not find that which constitutes the important thing in the present invention, namely, the responsive device responding to changes in the main or generated current. In respect to Fig. 1, the most that can be said is that it imperfectly describes that which was perfected in the subsequent patent now in controversy. It seems to me in other words that the language of the specification is strictly accurate where it declares that the present invention "consists in an improved construction and mode of use of the apparatus employed in patent No. 223,659."

Upon the subject of infringement I have no doubt. The question is not as to the form of dynamo the defendants may use or whether their machine may be adjusted by hand to avoid sparking, but the question is whether they use the complainants' invention by the employment of substantially the same means to accomplish the same result, namely, the regulation of the current by means of a device responding to changes in the main or generated current, and this the complainants have shown.

Let a decree be entered as prayed for in the bill.

Decree for complainants.

It is said the right to use the dynamo regulator, which was the bone of contention in the suit won by the Thomson-Houston Company against the American Company, is worth $1,000 a day.

The Leper Settlement on the Island of Molokai.

It is probably known to every one that leprosy exists to a considerable extent in the Sandwich Islands, but few, except those specially interested in the subject, know to what an extent it exists there, or what are the measures in force to isolate the sick and prevent the spread of the disease. In the biennial report of the president of the Hawaiian Board of Health we find an account of the leper settlement by Mr. R. W. Meyer, agent of the Board of Health in Molokai, from which the following facts are taken.

The settlement is on the island of Molokai, to which all lepers are sent as soon as their disease is recognized. On the first day of April, 1888, the number of lepers on the island was seven hundred and forty-nine, of whom four hundred and ninety-two were men and two hundred and fifty-seven women. It is curious to note that among this number were six British subjects, two Germans, one American, one Pole, one Belgian, and one Russian. Custom, and a bad custom it would seem, allows the relatives and friends of the sick to live in the settlement as long as they desire, and to leave it whenever they tire of their surroundings. Of these relatives and friends, called "kokuas," there were one hundred and forty-four. In addition to these there were forty-nine of the original inhabitants of the island or their descendants, called "kamaainas," who had not yet been driven away by their unwelcome neighbors. The entire population of Molokai, at the time of the report, was, therefore, nine hundred and forty-two. Of the buildings on the island in addition to the cottages of the residents, there are twelve hospitals, two dispensaries, one house for the resident physician, one prison (with accommodations for two inmates), one receiving house for new comers, one store, and five churches, of which two are Catholic, two Protestant, and, curiously enough, one Mormon. The total number of buildings is three hundred and seventy-four, of which two hundred and sixteen are owned by the sick or their friends.

The lepers, and the children born of leper parents at the settlement, are supplied with rations by the government, and also receive a bill annually which enables them to obtain at the store six dollars' worth of clothing, which is probably sufficient for the necessities of a warm climate. They are allowed to compound their rations for cash, if they so prefer. They also receive each half a bar of soap a month, and to every house or family is given one quart of kerosene oil per month.

There are certain defects in the management of the settlement which, if leprosy is a contagious disease (and the weight of medical opinion is in favor of that view), are to be accounted very serious and call urgently for remedy. The most important of these is the fact that "kokuas," the friends and relatives of the sick, are allowed to reside on the island as long as they choose, and then to leave whenever they desire to return to their homes. In this way, assuming that the disease is contagious, they spread it about and render null all the efforts made to repress leprosy in the islands. Another reform that is called for is the removal of paid nurses and attendants, and the substitution for them of sisters and others who are ready to devote their lives to the care of the sick, with no thought nor desire of returning to the outside world after having amassed a comfortable sum by the accumulation of their salary. That the management of the lepers, as far as they are themselves concerned, is to be commended, is evidenced by a letter addressed to Father Damien by Dr. Woods.

in which he says that, after having visited every one of those places where the disease prevails, he has not found the people so happy, so well taken care of and attended to as the leper settlement on the island of Molokai.—*Medical Record.*

The Sound of Thunder.

One of the most terse and succinct descriptions of a natural phenomenon is that recently given by M. Hirn, in which he says that the sound which is known as thunder is due simply to the fact that the air traversed by an electric spark, that is, a flash of lightning, is suddenly raised to a very high temperature, and has its volume, moreover, considerably increased. The column of gas thus suddenly heated and expanded is sometimes several miles long, and as the duration of the flash is not even a millionth of a second, it follows that the noise bursts forth at once from the whole column, though for an observer in any one place it commences where the lightning is at the least distance.

In precise terms, according to M. Hirn, the beginning of the thunder clap gives us the minimum distance of the lightning, and the length of the thunder clap gives us the length of the column. He also remarks that when a flash of lightning strikes the ground, it is not necessarily from the place struck that the first noise is heard. Again, he points out that a bullet whistles in traversing the air, so that we can to a certain extent follow its flight, the same thing also happening with a falling meteorite just before striking the earth. The noise actually heard has been compared to the sound produced when one tears linen. It is due, really, to the fact that the air rapidly pushed on one side in front of the projectile, whether bullet or meteorite, quickly rushes back to fill the gap left in the rear.

An Alleged Cure for Whooping Cough.

Dr. Mohn, according the *Revue Mensuelle des Maladies de l'Enfance*, May, 1888, claims that he has in a number of cases produced instant and permanent cure of whooping cough by fumigations with sulphur. His method of procedure is as follows:

In the morning the children are clothed and removed from their sleeping room, in which are hung all the clothing, toys, and, in fact, everything with which the children are brought in contact. In this room about four ounces of sulphur for every cubic yard of space is ignited, and the sulphurous acid allowed to remain in the room for about five hours. The room is then well aired, and the next evening the child sleeps in a room and bed which has been completely disinfected, and it is said that cure is at once produced. As to whether this will be attained in all cases, we do not presume to state.—*Therapeutic Gazette.*

TWO NOVELTIES IN THE ZOOLOGICAL GARDENS.

The young chimpanzee, one of the most recent additions to the Zoological Gardens, London, arrived from Sierra Leone some weeks since. It has been deposited with the society by Mr. Swanzy, Mr. Clarence Bartlett, the assistant superintendent of the gardens, going to Liverpool to meet his new charge and bring her to London. On her arrival in the gardens she was placed in the apartment adjoining that occupied by the well-known "Sally." Although the society at various times has received nearly forty specimens of this species of anthropoid ape, nearly all of them have arrived in such a sickly condition that they have been unable to withstand the rigor of our climate for more than a few days. About fourteen years ago one known as "Joe" lived for three years, and "Sally" has been in the gardens for five years. These two cases, however, are very conspicuous exceptions, and all interested in the matter will therefore be glad to hear that "Jennie" arrived in good health and spirits, apparently none the worse for her journey. If her owner intends leaving her with the society, which, as her chances of life are greater under the experienced care she will there receive, it is hoped he will do, the keepers, having such a good start, may succeed in rearing her. None of the previous specimens has arrived at such a tender age, for "Jennie" cannot be much over eighteen months old, and none of them has possessed such a quaint, old-fashioned face, which is the nearest resemblance to a human countenance which we have yet seen in the animal world.

She is very docile and intelligent, likes being petted, cries if she is left alone, and in her playful moments romps about in her cage with the zest of a child. To watch her antics as she climbs about on the bars, or rolls over in play, is quite a fascinating amusement, and the absurd way in which every now and then she sits down and, deliberately folding her arms, proceeds to pinch her weazen little face into grotesque grimaces at her keeper, is irresistibly comical. Our illustration is from a photograph by Major J. Fortune Nott, F.Z.S.

Our illustration of the tiger cub is from a photograph sent by Dr. Henry Buck, of Clapton. The mother of the cub was shot by Mr. Markham, C.S., in the Bignor District, India, Mr. Ribbentrop, the Inspector-General of Forests, Sir Edward C. Buck, and Mr. Reginald Burd being the rest of the party. On the previous day the tigress had killed a large panther, which, it was supposed, the anxious mother was afraid would attack the cubs. A grand fight must have occurred, for the natives who reported it say the roaring was terrific. Sir Edward Buck secured the cub, which is now about five months old, and it was at first fed entirely on milk out of a bottle, as represented in the engraving. The milk diet proved too rich, and a "committee of doctors" having "sat upon" it, it was decided to bring it up on raw beef juice, on which diet it apparently thrived. It had for some time as its playfellow a little pariah puppy, which was called "the poor companion." The dog was not in the least afraid of the cub, although the latter often jumped on its playmate as if about to kill it. The little puppy, however, would drive the aggressor off with a snap and a yap, and showed itself the master. The cub was brought to England by Mr. E. J. Buck, of Dhariwal, Punjab, in the P. and O. steamer Ballarat. It is quite tame, and was an immense favorite and pet among the passengers, one American gentleman offering a large sum for it. It was first taken to Dr. Buck's house at Clapton, where it played with his children in the garden, and on the 13th of August was conveyed to the Zoological Gardens.—*London Graphic.*

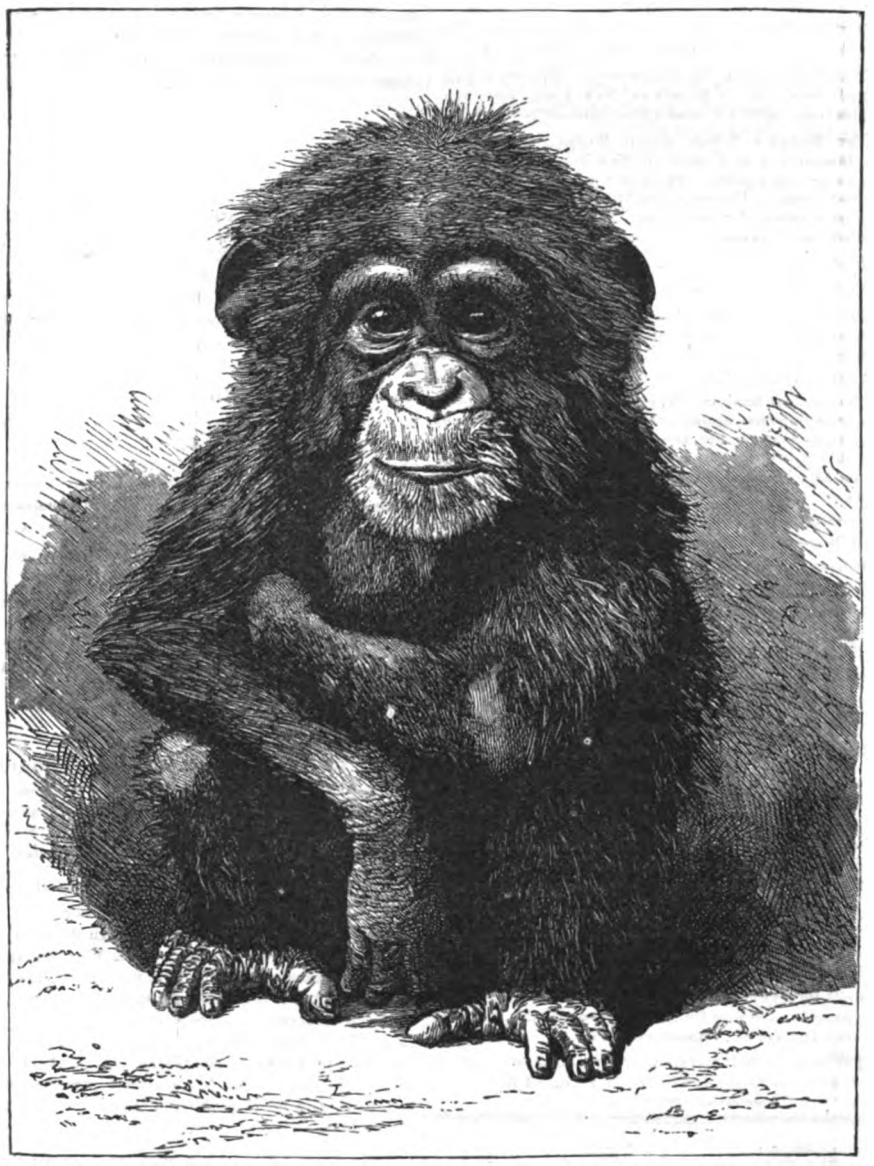
Death of the Central Park Chimpanzee.

Remus Crowley, the remarkably intelligent monkey of Central Park, New York, died there on the 31st of August last, greatly to the regret of the children and the thousands of people who were in the habit of visiting our city zoological collection.

The animal evinced great aptitude in acquiring human habits. He was taught to sit at table, partake of his meals, use the plate, fork, tumbler, etc. In his actions he sometimes displayed a wonderfully close relationship to humanity.

Mr. Crowley was born in June, 1883, in a remote part of the Congo country. W. H. Smyth, United States Minister to Liberia, bought him just as he was leaving Sierra Leone for home. The little chimpanzee stood the long voyage to Liverpool well, and when he arrived here in a White Star steamer, he was chipper and healthy. The city paid Mr. Smyth the $125 it had cost to bring Crowley to New York, and Supt. Conklin carried the stranger uptown in the pocket of his overcoat. He was then a little bit of a baby, weighing fifteen pounds or less. Supt. Conklin had a special cage made for him in the monkey house, and made Jake Cook his keeper. Jake named him, and began to train him at once. In a week he had taught him to sit at a table, and within a few months he had initiated him into the use of knife, fork, spoon, dish, and napkin.

Crowley spent his first winter in Mr. Conklin's office, where he ripped up lots of valuable books and had any amount of fun. As he grew bigger, he had to be moved from house to house, in order to accommodate the immense crowds who visited him. Last spring a cage was built for him, at a cost of $500. In one compartment of it lived Kitty, a chimpanzee, now two years old. Her native village is Banana Point, on the Congo River. She was to have been Crowley's mate, but his death came too soon.



YOUNG CHIMPANZEE FROM SIERRA LEONE.

TIGER CUB FROM INDIA.

ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. Lee P. Alden, of Tustin, Mich. This invention provides a coupling designed to be simple, durable, and effective, and in which the coupling may be automatically made and the cars uncoupled without the operator going between them.

A railroad switch has been patented by Mr. John S. Meyers, of St. Paul, Minn. This invention covers an improved switch adapted for use with fixed rails and points, designed to be simple and reliable, and capable of being operated by a lever located near the track or automatically from the engine.

A rotary engine has been patented by Mr. Charles F. Sleigh, of Fort Wayne, Ind. It has a cylinder having an outer steam chamber separated by annular inwardly extending flanges from an inner chamber in which a piston is held to rotate, provided at each end with a hub turning in suitable bearings on the steam cylinder, with other novel features.

A lubricator for car axles has been patented by Mr. Benjamin E. Dupont, of Lexington, Ky. This invention covers an improvement on a former patented invention of the same inventor, the lubricator being distributed to the bearing by a saturated waste packing, the present invention covering means to facilitate the introduction of the lubricating attachment and more equal distribution of the lubricant.

AGRICULTURAL INVENTIONS.

A stalk puller has been patented by Mr. John T. Whilden, of Stockton, Ga. A vertical shaft is supported by an axle platform, a wheel on the shaft having V-shaped teeth for holding the stalks, while a clearer is held above the wheel, so that as the machine advances the stalks will be pulled up by their roots and fall to the ground.

A churn has been patented by Mr. Nelson Smith, of Kearney, Neb. It has two sets of paddles, so arranged in a casing as to present their blades at an obtuse angle to each other, the length of the paddles being such that when revolved they will just clear the top, bottom, and ends of the case, and the paddle shaft adjacent, thus rapidly acting on every portion of the milk or cream.

MISCELLANEOUS INVENTIONS.

A combined latch and lock has been patented by Mr. Albert A. Kellogg, of Clinton, Mo. This invention covers a novel construction and combination of parts in a device which can be used for either or both purposes, and is durable and simple in construction and effective in operation.

A lock for sliding doors has been patented by Messrs. John M. Tunis and William F. Bedford, of Madison, N. J. This invention combines both a latch and lock, designed to be simple, durable, and inexpensive, which will not be unlocked by jarring, and applicable to rolling doors of all kinds.

A friction clutch has been patented by Mr. William E. Talcott, of Croton Landing, N. Y. It is especially adapted for use in connection with brick-making machines, the clutch section having a bearing face with undercut groove, in which ride the heads of clamping bolts of a second clutch section, with means for clamping the sections together quickly and readily.

A brick machine has also been patented by the above inventor. The invention provides means for starting, driving, and stopping the operating portions, improving the construction of the press box with yieldingly mounted traps, providing for adjusting the plunger when the machine is in operation, with other novel features.

An elastic pump rod has been patented by Mr. George D. Pierce, of Shelby, Iowa. The pump rod has a novel construction of springs and sliding guides for forming a connection between two sections of the pump rod, to cushion the stroke and thus reduce wear and tear by lessening the hammering action.

A roll paper holder and cutter has been patented by Mr. John Zerr, of Keokuk, Iowa. The construction is such that the paper, as it is drawn out in front of the fixture, is separated into the desired lengths by a slight pull sidewise over a suitable cutter, the free end portion of the roll being thrown up ready for the fingers to take hold of again.

A device for increasing the speed of vessels has been patented by Mr. Henry C. Smith, of Brooklyn, N. Y. A jacket is provided into which the blades of the propeller discharge water, which is forced into violent and constant contact with the back water, in a manner designed to aid the propeller in propelling the vessel.

A chicken brooder has been patented by Mr. John D. Wingert, of Fayetteville, Pa. It has a novel heat-distributing apparatus, consisting of a sheet metal plate with central opening, transverse ridges and deflecting plate, in connection with a special construction of box, swinging gang board, ventilating openings, and other novel features.

An apparatus for grinding button edges has been patented by Mr. Jacob Mahla, of Gablonz-on-Neisse, Bohemia, Austria-Hungary. This invention covers a novel construction and arrangement of parts in a machine for grinding the edges of buttons into a cylindrical or conical shape, the machine being adapted to grind several buttons at the same time.

A rod joint has been patented by Mr. John G. Spear, of West Winsted, Conn. This invention relates to joints for coupling the sections of gun rods, and is designed to simplify and strengthen the mounting of the spring bolt in the rod section and to facilitate the disengagement of the bolt from the hole in the sleeve on the other section.

An escape attachment for vapors and odors from cooking vessels has been patented by Annabella and Martha A. Kelly, of Holman Station, Ind. From each cooking vessel a bent pipe leads to a duct along the under side of the long or main cross bar of the stove top, and leading to the smoke pipe, whereby all obnoxious fumes or vapors will be conducted away.

A tailor's square has been patented by Mr. Herman A. Sens, of Cincinnati, Ohio. This invention provides an instrument wherein measures may be taken from the true angle of a square in any direction, being especially adapted for use by merchant tailors, dress and mantua makers, for establishing accurately the essential lines of a garment.

A music rack holder has been patented by Mr. Albert W. Utzinger, of Astoria, Oregon. It is adapted more especially for holding a book or sheet music on a clarionet, piccolo, flute, or other musical instrument, having rings adapted to the body of the instrument, and eyes to which a bar is fitted, with a collar fitted on the bar carrying a music rack.

An attachment for window frames has been patented by Mr. Valdy C. Overton, of Mobile, Ala. It has revolving stops, which may be turned into recesses in the casements of the door or window frames when it is desired to remove the door or window sash, whereby such removal will be facilitated for cleaning, painting, etc., while also affording a protection lock when they are replaced.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) A. L. S. asks: Is blacklead made of carbon? If so, could not the waste carbon stubs from electric lights be pulverized and used, and would it be suitable for moulding purposes? A. Blacklead is a mineral, and represents a modification of carbon never practically produced artificially. It exists in cast iron and to a certain extent in gas carbon, but battery carbons would not afford it.

(2) J. R. asks what oil of amber is, and how adulterated. A. Oil of amber is made from amber by dry distillation. It may be rectified by distillation from six volumes of water, (Sp.) gr. 0·840–0·940. Unattacked by iodine, sulphuric acid, or potash. It is used in medicine and perfumery. It is said that kerosene, turpentine, and resin are used in falsifications of it. We cannot give reliable formulæ of proprietary medicines.

(3) J. B. W.—The water pressure in locks is static, and equal to 0·43 of a pound per square inch for each foot in depth. Thus, at the bottom of a gate 10 feet in depth, the pressure would be 4·03 lb. per square inch, but the average pressure against the whole gate would be half the bottom pressure, as there is no pressure at the top. The pressure, is much greater on the paddle wheels of steamers from the impact or striking of the water by the paddles. The amount of pressure varies with the relative speed of the vessel and the slip. The dip of the wheels also is a factor.

(4) A. H. S. asks: If a boiler is tested to a pressure of 100 pounds per square inch, cold water pressure, what is the pressure of steam the boiler will safely carry? A. Boilers, when tested by competent inspectors at 100 pounds pressure, are allowed to carry two-thirds the test pressure. 2. The difference between hydraulic and steam pressure as generally used in testing boilers. A. There is no difference between hydraulic pressure and steam pressure, except the safety and convenience of examination. 3. Should the city inspector injure a boiler by putting on excessive pressure, would the city be responsible? A. This depends upon their motive. They are supposed to apply a test of 50 per cent more than the pressure that engineers and owners desire to carry. If the boiler does not stand it or is injured, the boiler must be repaired, strengthened or condemned.

(5) T. P. L.—The setting of the slide valves on a double engine is not different from the setting of the valves of two separate engines, *i. e.*, set each valve for its own engine. See Edwards' Practical Steam Engineer's Guide, $2.50, which we can mail. Die-cut threads on bolts and the like are slightly stronger than chased threads. The die compresses and hardens the iron in the thread.

(6) H. J. G.—For a free flowing solder use a mixture of two parts tin, one part lead. For a good soldering fluid dissolve zinc in muriatic acid to saturation. Then add a little sal ammoniac and dilute with 10 to 20 per cent of water.

(7) F. X. B. asks: Can the best quality of imported English tool steel be manufactured in this country? If not, what is the reason? A. Tool steel is made in the United States fully equal to the best English tool steel. What is still better, it is made in all the grades suitable for various kinds of tools.

(8) H. R. Y. writes: 1. Am making the the Holtz electric machine described in SUPPLEMENT, No. 278, and would like to know if wood posts will do as a substitute for glass for holding the collecting combs. A. Wood dried and dipped in melted paraffine or thickly shellaced will answer. 2. Will diamond cement do to cement the apertured plate with? A. Yes.

(9) S. E. H. asks: 1. How much will a body of air be reduced from its original volume when subjected to a pressure of 20 pounds to the square inch? A. ⅔ of its original volume. 2. What pressure per square inch will reduce the volume to one third? A. 45 pounds. 3. One half the original volume? A. 30 pounds. These are all on the assumption that the normal pressure of the atmosphere is 15 pounds to the square inch, which is approximately true.

(10) W. B. C. asks: How should I change the winding on the motor described some time ago, in order to use gravity cells? If these cannot be used, what is the reason? A. Gravity cells cannot be used for the motor, owing to their high resistance.

(11) C. H. F. asks: 1. How are steel ornaments, such as beads, etc., prepared to resist rusting as well as they do? A. Their very high degree of polish preserves the steel ornaments. 2. What compound placed in a case with albumenized silvered paper will prevent the paper from discoloring without injuring it? A. Keep the sheets of silvered paper between dry blotting pads previously dipped in a saturated solution of carbonate of soda. It should also be kept in a dry place. Prepared paper is sometimes preserved in tin boxes having a small quantity of chloride of calcium in the bottom.

(12) A. H. A. asks for a good acid proof cement for lining storage cells. A. Apply to the perfectly dry cells a mixture of 4 parts resin, 1 part gutta percha, and a little boiled oil, melted together and used hot.

(13) A. C. P. writes: A bets B that the sun is nearer New York city in summer than in winter. If at same distance, bet is off. Who wins A or B? A. B wins. The earth's orbit is eccentric. The perihelion or nearest approach to the sun takes place during the last days of December. New York is farthest from the sun about the last of June.

(14) C. A. B. asks in what year copper toed boots and shoes were introduced. A. The first use of copper for such purpose in any way is probably very ancient, but we believe the modern manufacture in a large way of such goods was commenced about twenty years ago.

(15) Q. A. S. asks: 1. Of what should I make the valves of a small air pump in connection with a small steam engine? A. Of rubber pure gum. 2. Provided the air pump has the same stroke as the engine, of what diameter should it be for a single, a double, and a triple cylinder engine, in comparison with the diameter of the high pressure cylinder? A. For equal stroke one-fifth the area of the high pressure cylinder in either case.

(16) E. G. B. asks the different ingredients that are put into the cheap blue glass that bottles are made of at the present time. A. 100 parts sand, 30 parts kelp or impure soda, 40 parts wood ashes, 100 parts potter's clay, 100 parts cullet or broken glass. Oxide of cobalt or smalt is added to produce the blue color.

(17) A. E. S.—Corrosive sublimate is chloride of mercury, an active poison. The Mammoth Cave, in Kentucky, had a subterranean stream that was called a river. Eyeless fishes were caught there many years since.

(18) W M. asks how to prepare linseed-oil to give it a heavy body that will endure, for rolling houses on which the paint is dull A. Simmer, with frequent stirring, 1 gallon linseed oil with ¾ pound powdered litharge until a skin begins to form, then remove the scum, and when it has become cold and has settled, decant the clear portions.

(19) H. C. H. asks whether, in laying out a trotting track, the distance is measured on the outside center or inside lines. A. All trotting and running tracks are measured 3 feet exactly from the inside curve or pole. No allowances are made on the track for time or drivings. Athletic tracks are measured 18 inches from curve in America, and 12 inches in Great Britain.

(20) F. J. R. asks (1) what wash leather is. A. It is usually split sheepskin dressed with oil, in imitation of chamois. 2. Whether iron rods can be used in place of brass ones on the Carre's dielectrical machine with as good effect? A. Yes, except for liability to rust.

(21) W. L. A. asks how to soften light leather, such as in linea, saddles, bridles, etc., without discoloring it. A. It is not practicable to do this after the leather is made up Rubbing well with oil and tallow, after a slight damping, will soften the leather, but will also somewhat discolor it.

(22) U. H. P.—For soldering solution, See query 6. This also makes a good dipping solution for tinning everything but cast iron. We know of no way of tinning cast iron by dipping. It can be imperfectly tinned by scraping the surface clean and using a copper soldering iron with pure tin and sal-ammoniac.

(23) J. R. desires (1) a receipt for a good ink for soldiers' belts. A. Dissolve 3 sticks of the best black sealing wax in ½ pint spirits of wine; keep in a glass bottle and shake well previous to use. 2. A compound to give a durable polish. A. Put ½ lb. shellac broken up in small pieces into a quart bottle or jug, cover with alcohol, cork it tight, and put it on the shelf in a warm place; shake it well several times a day, then add a piece of camphor as large as a hen's egg, shake it well, and in a few hours shake it again and add one ounce lampblack. If the alcohol is good, it will all be dissolved in two days; then shake and use. If the materials were of the proper kind and the polish correctly prepared, it will dry in about five minutes, giving a gloss equal to patent leather. For a white belt use white shellac and zinc white finely powdered instead of the lampblack. 3. What should be mixed with logwood to make ink? A. See recipes for inks in SCIENTIFIC AMERICAN SUPPLEMENT, No. 157.

(24) W. C., Jr., asks: 1. How are cattle horns, which are sold in art stores, polished, dyed, and mounted? A. Boil the horn to remove the core, unless it is already out. Scrape with glass or a sharp knife, dipping the horn in hot water occasionally to keep it soft. When all the roughness and spots are off, rub with fine sand paper or emery paper. When smooth as it can be made in this way, take powdered pumice stone or rotten stone, with a flannel cloth and linseed oil, and rub lengthwise until all the sandpaper marks are removed; then rub with a clean flannel cloth till fully polished. It is said that after this a cotton cloth and, finally, tissue paper will produce a still higher polish. A pair of horns can be mounted by taking a block of wood long enough to extend into the horns, leaving them the original distance apart. Then fill the horns with wet plaster of Paris and push them on the ends of the block. When dry, they will be solid. Cover the block with satin or plush. 2. How are metal vessels glazed? A. See "Enamels and Glazes" in Spons' "Workshop Receipts," 3d series, p. 204 *et seq.* We can send the volume post paid for $2. 3. If rain water becomes foul in a cistern, how can it be made pure, or how can it be kept from becoming foul? A. It can be purified by filtering through charcoal. There is no way to prevent its becoming foul except to keep the cistern clean, and have abundant access of air to the water.

(25) G. B. D. asks how to destroy vermin in a building. The building to be vacant. I wish something which will not destroy paint or wall paper. A. Close the windows and doors and burn sulphur. It will kill all vermin, but it will also bleach the wall paper. Unless you use sulphur, you will be obliged to fall back on borax and insect powder. Neither of which is radical.

(26) C. R. desires the receipt for preparing mocking bird food. A. Mix together 2 parts corn meal, 2 parts pea meal, and 1 part moss meal; add a little melted lard, but not sufficient to make the mixture too greasy, and sweeten with molasses. Fry in a frying pan for ½ hour, stirring constantly, and taking care not to let burn. This makes it keep well. Keep it in a covered jar.

(27) A. N. W. writes: 1. My plants are often infested with green lice, and sometimes with a small white fly or miller which remains on the under side of the leaf. Will you kindly give measures for destroying the insects? A. Take of quassia chips 3¼ oz., larkspur seed 5 drachms; boil these together in 7 pints of water until the decoction is reduced to 5 pints. When the liquid is cooled, it is to be strained and used with a watering pot or syringe, as most convenient. 2. What will kill carpet bugs or prevent their doing mischief to carpets and clothing? A. See "Sure Death to Buffalo Moths" on p. 112 of SCIENTIFIC AMERICAN for August 25, 1888. 3. Please give pronunciation of the word potpourri, and receipt for preparing the compound. A. Po'-poor-ee', see Webster's Unabridged Dictionary. During the rose season, gather a half peck of rose petals, take a large china bowl, strew a handful of table salt in the bottom, then three handfuls of petals, then salt and so on, until all petals are used. Let it remain five days, stirring and turning twice a day. They should now appear moist, when add three ounces of coarsely powdered allspice and one ounce bruised cinnamon. This forms the stock. Allow to remain a week, turning daily from bottom to top. Then put into the permanent jar one ounce of allspice, and, adding the stock layer by layer, sprinkle between the layers the following mixture. One ounce cloves, one ounce cinnamon, two nutmegs coarsely powdered, some ginger root sliced thin, half an ounce anise seed bruised, ten grains finest musk, half a pound freshly dried lavender flowers, two ounces powdered orris root, orange and lemon peel, and such freshly dried flowers violets, tuberoses, clove pinks or other varieties of highly scented flowers. Then add cologne, rose or orange and Florida water and any fine extract that will greatly add to the perfume. Shake and stir the jar once or twice a week and open only during the daily odorizing given to the apartments. Add at pleasure the following essential oils: Jasmine, rose, geranium, vervain, musk, rosemary, or neroli.

(28) T. A. S. writes: I do a great deal of plating in silver by an old process, but have forgotten the manner of dissolving gold into a liquid state. As soon as I dissolve the silver I can commence plating, but the manner of dissolving the gold to make it fluid I cannot find. A. Gold is dissolved by boiling in aqua regia and the nitric acid expelled by adding hydrochloric. The resulting solution of chloride of gold is boiled nearly to crystallization and then is dissolved in water. For manipulation in connection with the battery, see the article on "Electro-Metallurgy" in SCIENTIFIC AMERICAN SUPPLEMENT, No. 310

(29) B. B. asks: 1. What will remove cod liver oil spots from flannel and cambric? A. See the table given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158, for removal of oil and other spots from various fabrics. 2. How can I make pine or deal as white as new? A. Take one part calcined soda and allow it to stand ¾ hour in 1 part slaked lime, then add 15 parts water and boil. Spread the solution thus obtained upon the board with a rag, and after drying, rub with a hard brush, and fine sand and water. A solution of 1 part concentrated sulphuric acid and 8 parts water will enliven the wood after above application.

(30) C. L. W. asks: 1. What is the process of transferring a lithograph from paper to glass, so that it will become transparent? A. First coat the glass with copal varnish, when nearly dry but still tacky press on the wetted picture, face downward, smoothly and tightly. Let it dry thoroughly. Next damp the paper and rub it off with the finger, leaving the picture to be looked at through the glass. 2. How to make imitation frosted glass. A. Make a saturated solution of alum in water and wet the glass with the liquid. It is advisable to have the glass in a horizontal position, as then the solution is not likely to drain off. 3. How to make a stain for glass for the following colors: Bright red, orange, brilliant green, blue, purple? A. The addition of aniline colors that are soluble in water to the foregoing mixture, or a varnish colored with aniline dyes, may be used, but, of course, they are not permanent.

(31) W. J. asks: 1. What kind of tree is used in some countries for making bread? Do they use the bark only? Is there any nutriment in common sawdust? A. The breadfruit tree (*Artocarpus incisa*) furnishes a fruit that resembles bread in taste. It grows in the Pacific islands and elsewhere in the tropics. The cassava tree (*Manihot utilissima*) is indigenous to Brazil, and is cultivated in other parts of South America. The root, which is tuberous, contains starch and a poisonous matter. The starch is separated and made into meal, which is used to make bread. There is no nutriment in sawdust. 2. Is the Shipman engine patented in England? A. Yes.

(32) J. E. B. asks how to make a composition for statuettes, one which has clean white color, is strong, hard, and not too expensive. A. Soak plaster of Paris in a solution of alum, bake it in an oven, and then grind it to a powder. In using it, mix with water, and to produce clouds and veins, stir in any dry color you wish. This forms an artificial marble, and is susceptible of a high polish.

(33) J. E. D. asks: Will sound of cannons, bells, etc., break glass? Is there any case on record? Will sound if confined split a door? A. The concussion following or incidental to loud sounds has broken glass, etc., but we doubt if any authentic instance of such destruction by sound alone can be cited. Sound could not split a door.

(34) C. L. K. asks: 1. Was an absolute vacuum ever attained? If so, in what manner? Was Torricelli's a complete vacuum? Was there not vapor of mercury in it? A. The nearest approach to an absolute vacuum probably contains some vapor of mercury. It is doubtful if an absolute vacuum was ever produced, although it has very nearly been reached, so great a rarefaction being obtained that the static discharge would not pass. 2. What is the cause of the blue color of the sky? A. This has long puzzled meteorologists. It is believed that it may be due to very fine particles of liquid water in the upper regions of the atmosphere. The question is discussed in Ganot's Physics under meteorology, and the cause assigned is based on Tyndall's researches on the decomposition of vapors by light.

(35) M. A. M. and A. K. ask how to manufacture chewing gum, such as is sold by confectioners. A. Take of prepared balsam of tolu 2 ounces, white sugar 1 ounce, oatmeal 3 ounces; soften the gum in water bath and mix in the ingredients, then roll in finely powdered sugar or flour to form sticks to suit.

(36) G. H. H.—Spence metal is composed of ferrous sulphide of iron (FeS) mixed with melted sulphur. The ferrous sulphide is made by roasting iron pyrites and pulverizing before adding to the melted sulphur. See account of its discovery and uses in SCIENTIFIC AMERICAN SUPPLEMENT, No. 222.

(37) B. M. asks: What should be the size of a pair of small cylinders, suitable to run steam tricycle, on same plan as the one described in SCIENTIFIC AMERICAN, February 18. Also height, diameter, and thickness of plate for boiler, and number and size of tubes for same. A. The two cylinders should be 2 in. diam., with 3 in. stroke; boiler made of ⅛ in. copper shell, ¼ in. heads, riveted and brazed, and 20 seamless copper tubes 1 in. outside diameter and 1-16 in. thick. Diameter of boiler, 12 in.; height, 24 in.; fire chamber, 9 in. diameter, 10 in high. Or you may use the smallest size Shipman boiler, with 30 lb. steam pressure, and should be able to go 10 miles per hour over ordinary grades.

(38) J. B.—A pendulum in a perfect vacuum and absolutely free from friction should continue to vibrate indefinitely, possibly perpetually. But a perfect vacuum and freedom from friction are impossible. Granting the possibility of freedom from atmospheric and other friction, the motion of the earth around its axis, and the displacement of the center of attraction by the motion of the moon, would finally bring the motion of the pendulum within the variability of the centers of attraction, so that if there should remain any element of oscillation, it would be imperceptible.

(39) F. W. P. asks: How much white oak wood will make as much steam as a ton of good soft coal, such as is used for furnace purposes? A. One cord is the mean of many trials. Of hickory a little less is needed, and with pine a little more, white oak being a medium for steam making.

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Sleigh, J. Mack 389,397
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Snow scraper, W. J. Grounds 389,298
Soap cake, J. P. Greeley 389,296
Soldering machine, can, W. D. Brooks 389,438
Spout connection for cans and the like, E. W. Vacher 389,488
Spring. See Vehicle spring.
Square, tailor's, H. A. Sens 389,327
Stage effects, producing, W. Gillette 389,294
Stairways, guard for area or basement, J. J. Delaney 389,206
Stalk puller, J. T. Whilden 389,348
Stanchion, A. T. Fairbrother 389,209
Station indicator, automatic, E. Blamey 389,283
Steam boiler, W. N. Rumely 389,250
Steam generator, J. A. Eno 389,503
Steam regulator, T. J. Kieley 389,227
Stove, combined straw burning heating and cooking, G. Laube 389,395
Stove, straw burning cook, G. Laube 389,393, 389,394
Stoves, reservoir for oil G. M. Voltz 389,425
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Strap fastener, metallic, E. Latham 389,518
Sulky, trotting, J. W. Vaughn 389,267
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Torpedo signal placer, L. T. Mann 389,233
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Valve governor, F. C. & R. S. Prindle 389,484
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Vapor burner, E. J. Schauer 389,412
Vehicle, electrically propelled, W. H. Knight 389,229
Vehicle spring, M. P. Holmes 389,512
Vehicle wheel, H. W. Carroll 389,499
Vehicles, drag brake for, G. E. Haviland 389,301
Vehicles, motor box for electric, W. H. Knight 389,230
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Veterinary drencher, J. P. Lemmon 389,307
Vise, J. W. Cheney 389,199
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Wagon box fastener, M. Schmucker 389,324
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Water meter, piston, F. L. Sylvester 389,262
Weather strip, E. Stalker 389,418
Weigher, automatic grain, E. A. Hoover 389,513
Wells, drive point for driven, W. A. Royce 389,249
Wheel. See Vehicle wheel.
Wheel, S. A. Hawn 389,469
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Whiffletree hook, Barnes & Keith 389,433
Whiffletree hook, W. T. Legates 389,206
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Windmills, balance gearing for, W. & C. H. Tuckwood 389,342
Window, J. B. Zettler 389,490
Window frames, attachment for, V. C. Overton 389,405
Window hanger or hinge, A. Osterberg 389,241
Window screen, P. Miller 389,401
Wire apron, M. A. Sutherland 389,261
Wrench, E. C. Mead 389,400

DESIGNS.

Badge, A. A. Southwick 18,509
Banner, etc., C. H. Cooper 18,598
Chair brace, M. S. McQuarrie 18,607
Clock case, L. Krower 18,605
Cultivator knife or shovel, C. J. Carlberg 18,596
Embossed fabric, R. Krause 18,604
Harness ornament, G. S. Cascaden 18,597
Jewelry, S. M. Griswold 18,601
Knit fabric, S. N. Goodman 18,600
Knit fabric, G. Upton 18,610
Plumes, base for, E. Eicke 18,599
Type, font of, H. Brehmer 18,595
Type, font of, J. Guildenstine 18,602
Type, font of printing, C. E. Heyer 18,603
Type, font of printing, E. Lauschke 18,606
Watch case, F. Parker 18,608
Water closet, washout, J. D. Abraham 18,594

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Complexion or face powder other than medicated, J. A. Pozzoni Medicated Complexion Powder Company 15,856
Concrete gravel, O. S. Burdett 15,862
Cutlery and edge tools, Stacey Bros 15,859
Cutlery and edge tools, including skates, Stacey Bros 15,860
Dentifrices, Bruton & Deaderick 15,845
Face powder, hair dye, and cologne, medicated, J. A. Pozzoni Medicated Complexion Powder Company 15,855
Feather pillows and bags of feathers, Ely, Collins & Hale 15,847
Flour, Co-operative Wholesale Society 15,846
Flour, D. M. Gedge 15,864
Kerosene, Empire Refining Company 15,848
Medicinal lotions for removing blemishes from the skin, M. Burdick 15,863
Mowers, lawn, Lloyd & Supplee Hardware Co., 15,852, 15,853
Printing presses, types, type ornaments, and printers' tools, Union Type Foundry 15,861
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Rubber shoes, W. S. Nott Company 15,854
Shade rollers, spring, S. Hartshorn 15,865
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O. M. POE, *Colonel of Engineers, Bvt. Brig. General, U.S.A.*

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