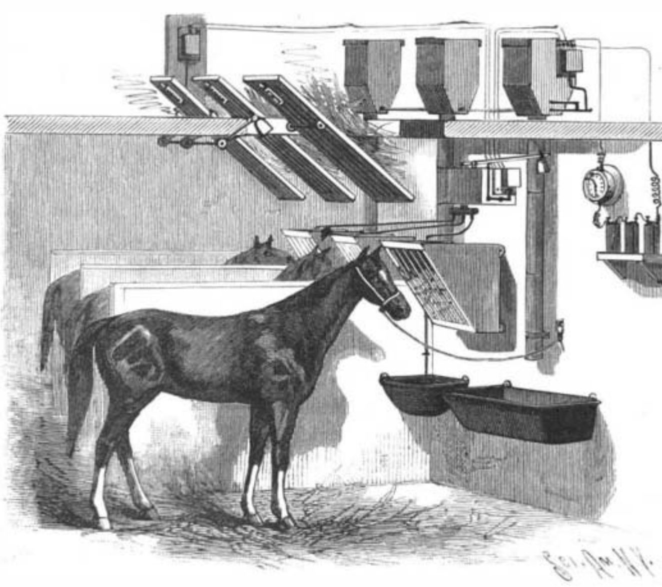
FEEDING AND WATERING LIVE STOCK.

The illustration represents some novel electrically operated devices, adapted to work automatically with a time mechanism, for feeding and watering live stock, or a manually operated circuit closer may be utilized in connection with the improvement if desired. A patent has been granted for this invention to Mr. Arthur C. Winch, of Saxonville, Mass. For feeding hay a pivoted rack is employed, journaled at a convenient point above the manger, the rack being tilted to discharge its load by the release of a catch on a weighted oscillating shaft which has a crank extending into the path of a releasing and locking bar held in a case operated by the electric mechanism, a number of racks being preferably arranged in series and operated by one locking box and bar. The grain is fed to the manger in a similar way from compartments each adapted to contain grain enough for one animal, any number of such compartments being provided. Leading from the bottom of each compartment is a discharge pipe, the slide covering the opening to which is connected with a shaft actuated by a bar from a locking and releasing box. The water is also similarly supplied from a tank arranged at a suitable elevation, the valve being controlled by a lever actuated by the locking and releasing mechanism. Each locking and releasing box has a similar mechanism, and each locking box has an automatic switch adapted to shunt or switch the current from one locking box to the next, so that the hay, grain, and water supplying mechanisms may be operated in succession. Any form of circuit-closing clock may be used in connection with the apparatus.



WINCH'S ELECTRICALLY OPERATED MECHANISM FOR FEEDING AND WATERING LIVE STOCK.

THE LONDON GIGANTIC WHEEL.

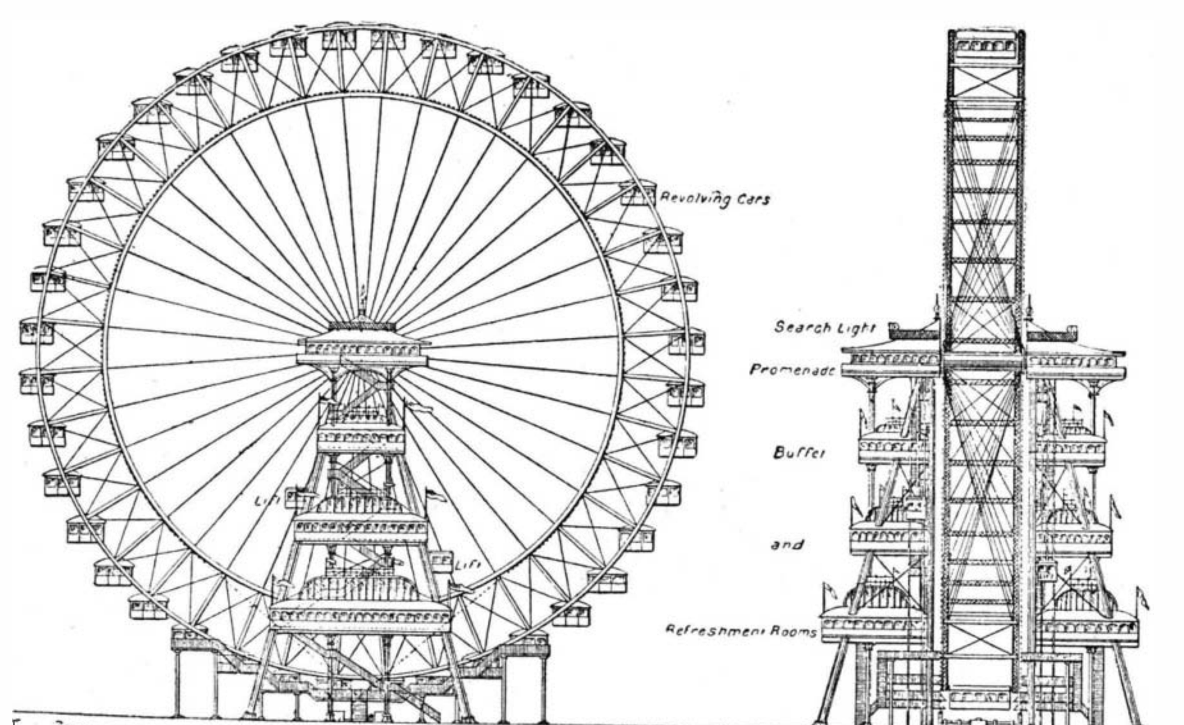
A company has been formed in London under the name of "The Gigantic Wheel and Recreation Towers Co., Limited," to construct and work a wheel somewhat similar to the celebrated Ferris wheel. It is to be erected at Earl's Court Exhibition, and the first length of one of the legs for the towers was recently placed in position. The *Engineer* says: The general design of the whole structure is by Lieutenant J. W. Graydon, and the contract has been taken by Mr. W. B. Basset, managing director of Messrs. Maudslay, Sons & Field, who is represented on the works by Mr. Efford. The wheel will be on the site occupied by the lighthouse last year, and the constructors hope to have it in working order by the end of June. It is to be 300 feet diameter, while the diameter of the Ferris wheel was 250 feet, and it will have accommodation for 1,600 people, instead of 1,368.

But it is not only in size that the Gigantic differs from the Ferris. The structures which carry the axle bearings are very different in appearance. The English wheel will be carried on two towers, 175 feet high, having on their tops, and at intermediate stages, saloons, surrounded on three sides by balconies. Communication with the tops of these towers will be by lifts as well as by staircases, and they will be connected by a passage running through the axle of the wheel. This is to be 7 feet diameter, and will be built up of mild steel bars and plates; while in the Ferris wheel the axle is a solid steel forging, 32 inches diameter and 30 inches at bearings.

Another great point of dissimilarity is in the manner of driving. On the Chicago wheel there was a circular cast iron spur rack, with teeth 24 inches pitch, actuated by a chain, which was driven from a steam engine. The new wheel is to be driven by a steel wire hawser 1⅞ inches diameter. There will be two of these, one on each side, passing round grooves on the sides of the wheel, at 195 feet diameter, but it is only intended to use one at a time. The motive power will be taken from two 50 horse power dynamos, and of these also it is calculated that one will be sufficient, and the other merely in reserve. The electric force for these dynamos will be supplied by Messrs. G. C. Fricker & Co., who, as in former years, have the contract for lighting the buildings and grounds; and the directors propose to introduce some novel effects in the way of lighting up the wheel by electricity.

The towers are being made and erected by the Arrol's Bridge and Roof Company, of Glasgow. Each tower stands on four concrete blocks, 15 feet deep, 15 feet square at top, and 18 feet by 19 feet at the bottom. The ground excavated is of firm, compact sand, mixed with shingle. Each leg will be held to its concrete base by eight steel bolts 2¼ inches diameter and 12 feet long. The shear legs, with which Messrs. Arrol have commenced to erect the towers, are themselves an interesting example of light girder work. Each leg is 94 feet long, 24 inches square in the middle, and tapering to 16 inches square at each end. They are formed of four 3½ inches by 3½ inches by ½ inch angles, joined by 2½ inches by ⅜ inch bars, stiffened by ⅜ inch plates at intervals. They stand 24 feet apart at the foot and 5 feet at the head, where they are joined by a cross piece. The first length of the tower leg which has just been erected is 5 feet 2 inches by 4 feet by 46 feet. It forms a box girder, with 6 inches by 6 inches by ½ inch angles and ½ inch plates, with a 5 inches by 2½ inches by ⅜ inch T stiffener on each side, and cross plates every four feet.

The axle is being made at Messrs. Maudslay's works in Lambeth, and the order for the carriages has been given to Messrs. Brown, Marshall & Co., of Birmingham. Of these there are to be forty, each 25 feet long, 15 feet wide, and 10 feet high, accommodating forty passengers. There will be eight stages from which they can be entered, so that the wheel will stop five times during each revolution, which will take about twenty minutes.



THE LONDON GIGANTIC WHEEL.

ANAGLYPHS.

The word anaglyph (from Greek ἀνά, "up," and γλύφειν, "to carve," that is, to carve in relief) is somewhat too pretentious, perhaps, for what it represents. It concerns, in fact, neither a cameo nor a bass-relief, but a stereoscopic photograph or stereogram of a peculiar kind.

Stereoscopy, that interesting and unfortunately so forsaken branch of photography, reserves for us in anaglyphs (for it is necessary to call these new prints by their name) an application which is both interesting and curious, and for which we are indebted to Mr. Ducos du Hauron.

It has been known for a long time that the sensation of relief and of aerial perspective is due to binocular vision. Each one of our eyes, in fixing an object, does not see it at the same angle, and consequently not in

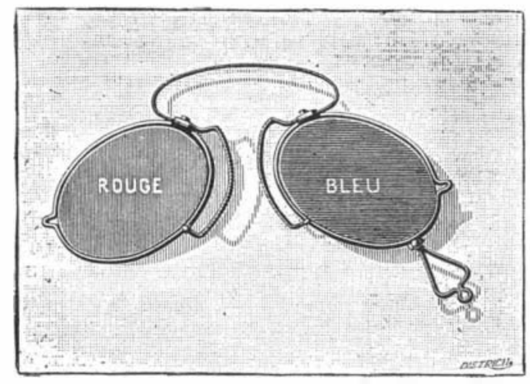


Fig. 1.—EYEGLASSES FOR EXPERIMENTING WITH ANAGLYPHS.

an identical manner, and it is from the sensorial superposition of the two images thus obtained that springs the notion of depth.

The general problem of stereoscopy consists, then, in showing to each eye the image of an object such as it would see it, and from the cerebral or subjective superposition of these two images will arise the impression of the real relief of the thing represented. But here supervenes a little difficulty. If we present

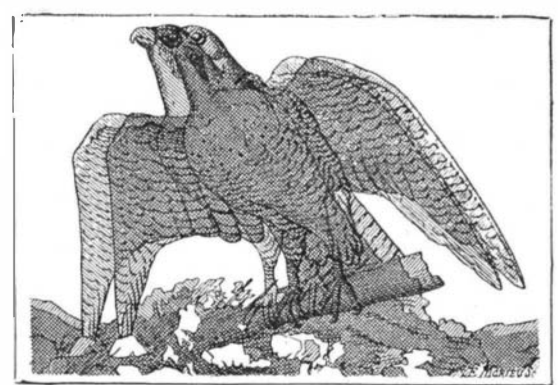


Fig. 2.—SPECIMEN OF AN ANAGLYPH FIGURE—SUPERPOSED RED AND BLUE COLORS REPLACED BY TINTS.

two slightly dissimilar images to our eyes (let us admit that it is a question of two photographs taken from two points distant from the space between the eyes), each eye will not see solely the image corresponding to that which it would receive of the reality, but rather the two at once, on account of the extent of the visual field.

Moreover, if the left eye desires to fix the center of the left image, the right eye will immediately converge toward the same point instead of directing itself toward the center of the right image. If we suppose, as is necessary, that the distance from the centers of the two photographs is equal to that of the separation of the eyes, it would be necessary, in order that each might regard corresponding points in each of the images, that the view should be directed at a point situated in infinity, for, in this case, the optical axes are parallel. Now, the eye contains an optical apparatus, the crystalline lens, which does not admit of a fixed focusing for all positions, but which, on the contrary, possesses the wonderful property (called accommodation) of furnishing an instantaneous and automatic focusing for any distance whatever, and such distance it calculates in a mathematical, trigonometric manner. It is precisely the convergence of the eyes that furnishes it to it.

Vision, consequently, is caught between two equally defective alternatives; either each eye is directed toward the center of each of the images, and then what we see is flat, because, the optical axes being parallel, distinctness exists only in very remote objects; or else we observe distinctness, but then the two eyes are directed upon a single one of the two photographs.

In order to obtain at once a clear vision of a single image by each eye, we are, therefore, obliged to employ an artifice. The ordinary apparatus known as the Brewster or refraction stereoscope permits us to solve this problem. In fact, upon interposing between the eyes and the photograph two prisms whose edges are turned toward each other, we shall succeed, upon properly selecting their angles, in having the virtual superposition of the different points of the two images, and consequently the relief, while allowing the eyes to converge to the same degree as in ordinary vision, which is precisely the result sought. The angles of the prisms may vary within certain limits, for we can obtain an exact adaptation in causing their distance from the images to vary. By this process, in spite of everything, three images would be seen, a central one in relief and two flat ones. These two latter may be got rid of by placing between the prisms, and at right angles with the photograph viewed, an opaque partition that limits the field of each eye.

It is possible to see stereoptically by dissociating, through practice, the convergence of the accommodation, that is to say, by bringing about an artificial strabismus; but such a process is lengthy, tiresome and not very practical.

After these considerations, and to return to the anaglyphs, we may define them as a colored image stereoscope. Let us suppose that, upon the same sheet of paper, we print two stereoscopic figures in two different colors, so that their corresponding points shall be at a very short distance from each other (Fig. 2). Let us admit that the colors selected, which should be very different, are blue for the left image and red for the right. At first sight these two prints, which, from what we have just said, will be naturally entangled with one another, will be confused and offer a not very agreeable and not very comprehensible mixture. But, if we view them with a pair of eyeglasses having a red glass in front of the left eye and a blue one before the right (Fig. 1), the scene immediately changes, and to the primitive chaos succeeds a harmonic and striking impression of relief and perspective. What has taken place? Something which at first sight is a little paradoxical, or at least odd. The left eye, provided with its red glass, will be able to see only the left image, which is blue; the second or red image, representing the other print, becomes invisible, because a red figure upon a white ground is not perceptible in red light. For the same reason, the right eye sees only the image that is destined for it, and the stereoscopic superposition ensues instantaneously. The convergence and accommodation are satisfied at the same time, because the two prints present but an insignificant spacing in the limits of which the focus is still sufficiently exact. Besides, the images may be of any size, since, whatever be their dimensions, they can always be printed as close to each other as may be desired, or, better, one upon the other.

In order that the effect may completely succeed, certain conditions are requisite. The prints must be of quite light shades and the glasses must be of dark ones. Consequently, it is necessary to use an intense illumination, otherwise, seeing the great absorption of light, the result will be dull and somber.

If the rays reflected by the prints and admitted by the glasses were absolutely monochromatic, the images would appear in black upon a ground represented by a mixture of the two colors adopted. In fact, an image emitting blue rays only must become black in red light, since all the rays that it sends back are arrested by the red glass, that is to say, it will present itself under the appearance of a colorless print upon a monochromatic ground. Will this new kind of stereoscopic prints, which requires the aid of phototypy and quite a profound knowledge of colors, have a practical result? We know not. It is evidently not a process for amateurs, but it is interesting from a theoretical and scientific point of view. It will prove a curiosity to the unscientific, to whom it may be presented as a sort of puzzle, the solution of which is found in a pair of eyeglasses. For such a purpose it may be destined to meet with a certain amount of success.—*La Nature.*

Improved Process for Steel Castings.

At the recent meeting of the Iron and Steel Institute, a paper was read by Mr. G. J. Snelus, on the Walrand-Legenisel process for steel castings. This process consists of adding to the metal in the converter at the end of the ordinary blow a definite quantity of melted ferro-silicon, then making the after-blow, turning down when the extra silicon has been burned out, and adding the ordinary final additions of ferro-manganese, etc., as circumstances required. The advantages of this process are that first an ordinary Bessemer pig can be used with 2 to 3 per cent silicon, thus insuring a seel perfectly free from carbon; secondly, the combustion of the added silicon produces such a large amount of heat at the right time, and so rapidly, that the metal becomes very fluid; the third advantage claimed is that as the silicon burns to a solid, it leaves the metal perfectly free from gas, and the steel is sound and free from gas cavities; fourth, that in consequence of the metal being so fluid and already free from oxide of iron, the ferro-manganese or other substances added, such as aluminum, are more effective and remain in the final steel. Another advantage secured by this process is that in consequence of the fluidity of the metal much more time and facility is given for casting operations. The author gave detailed descriptions of experiments he had seen made with this process, and quoted figures in support of his contentions. The system of casting is, however, confessedly expensive, and it would seem to be more especially suitable for those engineering works where it is desirable to have a steel foundry attached, and in which the demand would naturally not be so continuous as in the case of an establishment devoted entirely to the production of steel castings. It may be stated that the price of steel as it stands in the ladle is given as 4s. 6d. per cwt., while the cost of a complete installation of moderate size would be about £3,500.

Ball Bearings for Wagons.

"Ball bearings are successful only when the balls themselves are of the highest quality, and the shells and axles are of the best steel hardened and ground to the highest perfection. The limit of error in the best does not vary more than one-quarter of one-thousandth of an inch, or one-fourth the thickness of tissue paper. Such perfection is very costly and the least dirt destroys the whole gain, for if the balls be stopped by any impediment, they are very soon ruined. Such accurate work is not likely to be properly protected or properly cared for in farm vehicles. Hence it is questionable whether the failures would not more than overbalance the advantages; besides, in the cost of drawing a load, a part is friction and a part is overcoming the ground resistance. The poorer the road the greater is the ground resistance, and this has a great bearing on the percentage of advantage; for supposing that, in the case of a trotting sulky, the friction is half the resistance and the ground resistance the other half. Now if we reduce the friction one half, the power required to draw the sulky would be reduced one-quarter, or twenty-five per cent, whereas if in drawing a lumber wagon the friction is ten per cent and the ground resistance ninety per cent—which on a farm and farm roads is about what it amounts to—then by reducing the friction one half we have reduced the actual power required only five per cent.

"The time has not come when it will pay. It will be an infinitely better investment to use the same money to put wide tires on the wheels and cut off the forward axles so as to bring the forward wheels the width of the tires nearer together than the hind ones.

"I have just been over a dirt road where one hundred tons of limestone are drawn every day, and the ruts were horrible when only common wagons were used. The road is now splendid, all owing to the use of half the number of wagons built as above described, while the ball bearings could at the best reduce the power required to draw farm wagons only from five to ten per cent. The wide tires and short axle wagons would reduce the cost of hauling on the farm roads forty to fifty per cent, and the cost of the changing to ball bearings would equal the cost of the new wheels and front or back axles."—*Prof. Sweet, in Rural New Yorker.*

The Columbia's Official Trial.

The commerce destroyer Columbia returned from her forty-eight hour trial on May 22. Under natural draught, using the three engines and the eight boilers, she developed a sea speed of 18½ knots per hour which is certainly as satisfactory as when she made 22·31 knots off the Maine coast last fall, when forced draught, picked coal and trained stokers were employed. On the return trip from the trial off the New England coast a speed of 19 knots per hour was made, but at that time the Columbia registered only 7,300 tons, while on May 18 when more fully loaded she registered 8,400 tons. The conditions were varied in the last trial so that the capabilities of the vessel were fully tested. The coal endurance was shown to be remarkable. At a speed of 10 knots an hour she can steam on thirty-five tons of coal per day. The amount of power developed by the engines has not been yet made public. The battery was also tested, some minor defects being developed. We illustrated and described the Columbia in our issues of the SCIENTIFIC AMERICAN for November 25 and December 2, 1893.

French Prosperity.

The United States consul in Bordeaux makes, in a recent report, some interesting observations on the growth of French prosperity during the past twenty years. Since the fall of the Second Empire, for example, the production of coal in France has increased 90 per cent and its consumption by 71 per cent. The tonnage of the goods transported by railway has increased 87 per cent, the number of travelers by rail has doubled, postal business has augmented by 140 per cent, the cash reserve in the Bank of France has doubled, between 1869 and 1891 the funds in the French savings banks increased fourfold, people throughout the country are in easier circumstances, and "if the burden now laid upon the taxpayer is heavier than formerly, he has, to say the least, greater resources at his disposal. Under no *regime* has wealth in France developed with such rapid strides as under the present system of government."

Correspondence.

The Destruction of Incandescent Lamps by Static Discharge.

To the Editor of the Scientific American:

In SCIENTIFIC AMERICAN of May 5, A. C. R. speaks of the static charge in an incandescent lamp destroying the carbon filament. I have tried the same thing of holding a lamp over a moving belt. The lamp acts as a Leyden jar, and holding it by the glass globe can be charged with a current that will be discharged when the brass base is touched. I have repeated the experiment many times without injuring the filament of the lamp, but find that a burned out lamp will answer equally as well.

One of the old style incandescent lamps, made two or three years ago, if charged and laid away so the base does not touch anything, will hold the charge for several days.

The best way to produce the "northern lights" effect is to charge two lamps separately over a belt and touch the bases together in a dark room.

Villisca, Iowa. H. C. STODDARD.

To the Editor of the Scientific American:

In correspondence column of your issue of the 5th May, A. C. R. asks, after stating instances of incandescent lamps burning out immediately after being brought near to or in contact with an object charged with static electricity: "What is there about this static display in a vacuum that destroys carbon filaments?"

In reply will say I have had a number of lamps destroyed by being hung near running belts. I find that the carbon of the lamp is attracted by the belt, and if not broken by the violent bending, a minute fracture is made in the glass whenever the heated carbon touches it, and though this fracture is usually a minute speck difficult to detect, it is sufficient to admit enough air to burn out the carbon in a short time.

Decatur, Ill. ROBT. FARIES.

Tuberculosis in Relation to Animal Industry and Public Health.

This is the title of a valuable "Bulletin" written by James Law, Professor of Veterinary Science at Cornell University, and issued by the Veterinary Division of the Agricultural Experiment Station of that institution.

The pamphlet is evidently the result of careful study of the subject. The following topics are treated with satisfactory fullness, many experiments upon which the statements are based being given:

"The Prevalence of Tuberculosis in the Lower Animals;" "The Germ Bacillus Tuberculosis;" "Accessory Causes of Tuberculosis;" "Lesions and Symptoms;" "Tuberculin;" "Danger from Flesh;" "Danger from Milk;" "State Measures for the Prevention and Extinction of Tuberculosis in Farm Animals."

A copy of this important pamphlet, numbered "Bulletin 65," will be sent free to physicians and members of boards of health on application to I. P. Roberts, director, Ithaca, N. Y.

Failure of an Eighteen Inch Armor Plate.

For several weeks those interested in the army and navy have looked forward to the test in which the largest gun made in the United States should measure its strength against an 18 inch Harveyized armor plate; but they were disappointed. The test occurred at the Indian Head proving ground, near Washington, on May 19, but the 12 inch gun was substituted for the 13 inch. The result was an utter failure of the plate, involving a loss to the Bethlehem Company of $20,000. The first shot smashed the plate, leaving cracks four inches wide; the second projectile finished the plate. The shot was a Carpenter armor-piercing projectile, and was propelled by 269 pounds of brown prismatic powder. The muzzle velocity was 1,465 feet per second; the shot struck with an energy of 12,660 foot tons. The plate was 16 feet long, 7½ feet wide, and the larger portion was 18 inches thick. The plate was set up against a solid oak backing, 3 feet thick, which was in turn secured to a heavy framework abutting on the cliff. The plate was broken into three pieces by the first shot. For the second shot the charge of powder was increased to 419 pounds, the muzzle velocity was 1,926 feet per second, and the striking energy was 21,182 foot tons. The shot was directed toward the largest fragment, it was broken in two, the backing was almost all destroyed, and the projectile was shattered to pieces.

The test of this one plate does not necessitate the rejection of the entire order—600 tons of armor, worth $300,000—as the Bethlehem Company can supply another plate; but should the second prove defective, the entire lot will be rejected. The delay will affect the completion of the Indiana particularly. The Harveyized process will not be discredited until after the test of another plate. Thinner plates treated by this process have proved very satisfactory, so there is no immediate cause for alarm.