SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

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

Vol. LV.—No. 9. [NEW SERIES.] NEW YORK, AUGUST 28, 1886. [Price 10 Cents. $3.00 per Year.

BRUSH'S COLOSSAL DYNAMO.

BY H. C. HOVEY.

The accompanying cut represents the smallest and the largest dynamos thus far manufactured by the Brush Electric Company, of Cleveland, Ohio. Before proceeding to describe the latter, it may be of interest to mention the facts concerning the original dynamo produced by this inventor.

It is related that about nine years ago Mr. Charles F. Brush, then a professional chemist in the city of Cleveland, intimated to his friend, G. W. Stockley, at that time President of the Telegraph Supply Company in the same city, his purpose to make a dynamo that should excel the French and German machines. Without further ado, Mr. Brush completed his dynamo in about two months, brought it to the factory, set it to work, and found it to work successfully on the very first trial. It was purchased by other parties, and has been running constantly ever since without needing repairs. This illustrates the quietness and thoroughness with which this distinguished inventor works. A peculiarity of his method is that he wholly discards empirical experiments; but when he sees that some new machine is demanded, he proceeds to meet the demand.

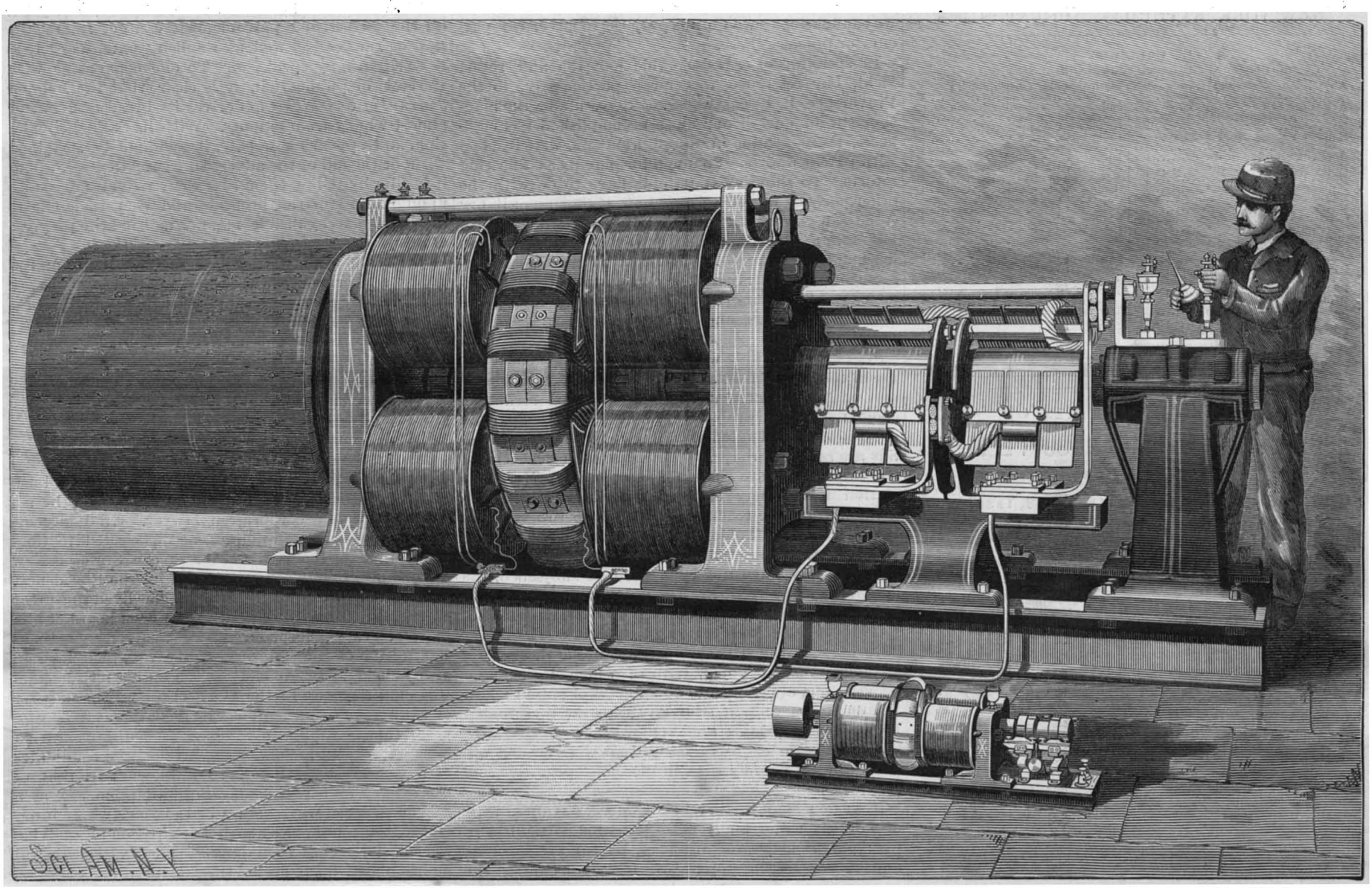
In this he is greatly aided by his remarkable powers of vision. He will draw his original designs, send them to the pattern maker, and when the model is returned will, by his unassisted eye, detect any deviation to within the sixty-fifth part of an inch. He can also, it is said, subdivide an inch into hundredths, using only a common pocket ruler, and do it so accurately that on testing his work by the vernier it shall be found correct to within two one-thousandths of an inch.

Last spring Mr. Brush contracted with the Cowles Electric Smelting Company (then of Cleveland, but now removed to Lockport, N. Y.) to build and deliver a 500 horse power dynamo within three months, under forfeit. He made no model nor experimental machinery, although the mechanical design was new, as may be seen by the cut, and the electrical proportions had to be worked out entirely *de novo*. He simply made his working drawings and placed them in the hands of Mr. Possons, the company's superintendent. The patterns, of course, had all to be made new. The machine was built exactly according to the original drawings; its parts were duly assembled; it was set in place and tested for ten days with a 500 horse power engine under all varying conditions of load, and it was found to realize all expectations, not only in the output of current, but in all mechanical and electrical details. The problem of the commutating arrangements for currents of 3,800 amperes at 100 volts would alone have been enough to discourage ordinary electricians.

The commutator of Brush's "Colossus" performed its functions perfectly on the first trial, and no difficulty whatever was experienced in this respect. In order to avoid attacking this very problem, Mr. Gordon, in making his great dynamo, was obliged to make the field magnets revolve, the armature remaining stationary. Gordon's dynamo, built several years ago in England, was the bulkiest machine of the kind ever constructed, being two or three times as heavy as Brush's "Colossus." It had nearly as great electrical capacity, but did not work for any great length of time, when, as we understand, it went all to pieces on account of mechanical imperfections. The "Colossus" represents the latest advance in dynamo building, having the greatest electrical capacity of any machine ever hitherto made—having, perhaps, five times the capacity of Edison's famous "Jumbo." Indeed, the Brush Company itself, a few years ago, would have had to build a dynamo of double the size to get the same capacity. But this dynamo embodies all Mr. Brush's latest improvements, and may safely be pronounced the foremost achievement of its kind.

The work to be required of it at the Cowles Smelting Works will be the reduction of refractory ores. This company has for some time past been using a Brush dynamo of 125 horse power, and the results attained have been so remarkable as to justify the expectation of still more wonderful triumphs by the means now placed at their command. Precisely what these may be, however, is as yet a matter of conjecture.

Those already familiar with the dimensions and powers of other dynamos will be specially interested in the following data, given by Mr. Brush, concerning the "Colossus:" The whole machine is 14 ft. long, 5 ft. 2 in. high, 4 ft. 2 in. wide, and weighs in all 22,000 pounds. The weight of the copper wire used on the machine is 6,250 pounds. The diameter of the pulley is 40 in., and of its face 45 in. The normal speed of the dynamo is 430 revolutions per minute. The electrical capacity is 300,000 watts, or the equivalent of 5,000 incandescence lamps of 16 candle power each. We show in the foreground of our picture the smallest sized dynamo made by the Brush Co. The appearance of the largest and smallest machines may be seen at a glance.



BRUSH'S COLOSSAL DYNAMO—THE LARGEST IN THE WORLD—FIVE HUNDRED HORSE POWER.

Eli Whitney Blake.

This well known inventor died on August 18, 1886, at his home, No. 77 Elm Street, in New Haven. He was born on January 26, 1795, at Westborough, Mass. He graduated at Yale in 1816. His uncle, Eli Whitney, persuaded him to join him in conducting the arm factory at Whitneyville. This was the origin of the famous Whitney Arm Company. He invented the famous Blake stone crusher, which has worked a revolution in all operations where minerals are to be crushed. Its familiar intermittent sound, as it crushes stones and minerals, can be heard in all parts of the world.

Mr. Blake was not only an inventor, but he figured also in the scientific world. He was one of the founders of the Connecticut Academy of Arts and Sciences, and for several years was its president. A number of papers from his pen appeared in the *American Journal of Science* and other scientific papers. A collection of a number of his papers was collected and published by him in 1882. The work was entitled, "Original Solutions of Several Problems in Aerodynamics." In 1879, he received the degree of LL.D. from Yale College. For 65 years he was a member of Center Church, New Haven. He was a signal example of the successful inventor, his fame being derived from a single device.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, AUGUST 28, 1886.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 556.

For the Week Ending August 28, 1886.

Price 10 cents. For sale by all newsdealers.

THE EFFECT OF PATENTS IN THE DEVELOPMENT OF THE GAS INDUSTRY.

Some weeks ago, an article on the present status of the gas industry in America appeared in this journal. After reviewing the changes that have taken place, and improvements that have been made during the recollection of the younger gas engineers, the natural conclusion was reached that much of this advance was due to inventors, encouraged in their work by the protection of the patent laws. This belief was predicated on several facts, in great measure on the numerous gas process and apparatus patents taken out every year. Since the article in question appeared, our position has been attacked by the London *Journal of Gas Lighting*. It thus states our review of improvements: "The progress in gas making is summarized as consisting of an advance from a production of from 9,300 to 9,600 cubic feet of gas per ton of coal, when carbonized in 20 inch retorts, yielding from 5,500 to 6,000 cubic feet per day, to a yield per ton of 12,000 cubic feet and a double duty from the retorts, which are stated to be sometimes 36 inches wide, and worked at a high heat by means of generator furnaces." Apparently, our contemporary disputes these statements, but as we presumably know more about American gas engineering we prefer to let the statement speak for itself. What we are most concerned about are the statements that follow, to the effect that patents have little or nothing to do with this progress. Our contemporary in words challenges us "to show the patents under which the progress already mentioned can be realized." This of course we cannot do, as we do not propose to advertise patents or processes here.

In speaking of a 12,000 cubic foot ton and retort yield, our reference was more particularly to the Providence, R. I., gas works. There, under the management of one of our most accomplished gas engineers, these results, in round numbers, were reached with patent retorts. So much for patents as affecting retorts. To show what patents have to do with the other parts of works, we may now review an ordinary American gas works. The retorts will be fitted with self-sealing lids, patented, that do away with the old luting and loose cutterbar. The next point in the manufacture is to preserve a steady vacuum on the hydraulic main. To secure this end, overflow tar valves, engine gas governors, and engine steam governors, all patented, patent smooth running exhausters, with patent compensators, will be found simultaneously in use in many or almost all coal gas works. Condensers and washers of different types and friction scrubbers come next, each probably patented or perhaps the subject of several patents. Then come purifiers, whose lids are raised, perhaps, by patent traveling cranes and whose contents are sustained on patent grids. The station meter may embody several patents. The holders are next reached. There little progress has been made. Gas holders in this country are the same to-day as they were ten years ago, and accordingly we find that they have not been favorite subjects of the inventor's art. There are few patents connected with holders. Hence comes the lack of improvement in them. Finally, to finish our review of gas works, the outlet governor, controlled, perhaps, by an automatic pressure changer, must be noted, both of which, if of an approved type, are certain to be subjects of patent right. The course of the gas through the works is regulated by patent gas valves and center seal. On the most moderate estimate, from ten patented structures upward will be found in use in the most primitive coal gas works.

If we go a step further into a more advanced type of works, we find many more patented structures in use; patent generator furnaces, patent tar burners, and patent testing apparatus, for determining the quality of the gas. The water used for scrubbing is accurately measured by patent water meters. The profession in this country has to render tribute to England for many of these advances, notably in condensing, washing, and purifying processes, all patented. The gas engineers of our contemporary's country are as quick as those of our own land to patent everything.

It seems idle to say that patents have had nothing to do with the advancement of the gas industry in this country, after the above showing. For every device named above, many representative names of patentees could be given, were it not out of place here.

To leave coal gas and enter the realm of water gas, we find more emphatic testimony on our side. Out of some six thousand millions of cubic feet of gas made per annum in this city, over half is made by patent water gas processes.

In examining English gas engineering, the same thing is found to prevail there. Paper after paper has been read at their engineers' meeetings on the coal liming process—patented. The most advanced attempt at purification by ammoniacal liquor, on which a very interesting paper was read at the recent meeting of the Gas Institute, and which was duly reported by our patent-hating contemporary, is patented. Reviewing the advertising columns of our contemporary, we find innumerable patents advertised, all more or less connected with the gas industry. Can any one assert that all the necessary expense incurred in perfecting these inventions would have been incurred without hope of reward?

Furthermore, it must be stated that in our hasty summary we have given nothing like a full catalogue of devices, the subject of patents, actually in use today. Leaving the gas works, we find gas burned in improved patented burners, that, compared with the unpatented rat tail burner of the past generation, give, on a moderate estimate, ten to fifteen times the light per unit of gas. To compete with the electric light a cheapening of light was necessary, and immediately patent regenerative burners appeared that multiply the light given by the best of the burners of five years ago, two and three fold. This was within the last five years. We repeat that the inventor's record in the gas industry is an honorable one, and that the progress of the last fifteen years owes everything to him.

The literature of gas engineering, at least in the case of our esteemed contemporary, seems deeply concerned in patents. Of its forty-eight pages, no less than twenty-six are filled with advertisements, for the most part of patented articles or mechanisms more or less pertaining to the gas industry. For example, a full page is devoted to advertising a patent scrubber, another a patent regenerative gas burner, another a patent retort drawing and charging machine, and so on. In attacking patentees, it carefully distinguishes between business and sentiment, accepting all the advertising patronage it can get from "the host of Yankee" as well as English "patentees" that it so slightingly speaks of. To one conversant with the cost of publication, it is clear that the London *Journal of Gas Lighting* derives its bread and butter almost wholly from patents. With its limited circulation, and appearing weekly, it could not be sustained without the aid of the advertising gas patentees, whom it insults by telling them that their patents are a drag upon real industrial progress and that their efforts have in no recognizable manner assisted the progress of gas making.

In all that we have ever said in our columns on the utility and beneficent effect of the patent laws, we are sustained by the words and practice of the best jurists both of this country and England. In the recent revision of the patent laws of Great Britain, we have found another confirmation of our views. Thus supported, we may with propriety consider our opinions well sustained and just.

THE TILDEN TRUST.

The late Samuel J. Tilden began his professional career in the law. Owing to his aptitude for business calculations of the most intricate class, he acquired fame as a corporation lawyer. Gradually assuming importance in politics, he was elected to Congress, then chosen as Governor of the State of New York, and subsequently nominated for the Presidency. Since that last exciting period he has lived to a great extent in retirement, and little has been heard of him in later years, except where he was referred to as the Nestor of the political party to which he had always belonged. He had retired on his fortune, and was only a power in the sense of being the adviser of acting politicians. When he died, it was to be supposed that he would, to a great extent, disappear from memory, except as one of the presidential candidates of 1876. No reputation is so evanescent as that of the lawyer and politician. Both of them are, as a rule, concerned with issues of the day, whose interest soon dies out. Any such anticipation of oblivion for Mr. Tilden has been done away with. By his will he has placed his name by the side of those of Astor, Lenox, Ottendorfer, Peabody, Vassar, and Holloway.

The composition of the will, that will do much for his reputation with posterity, and that has already lifted him from the level of the successful politician and business man to the pre-eminence of the philanthropist, presumably occupied much of his time during the last two years of his life. In it he provides for the management of immense residuary legacies, to be devoted to benevolent objects. New Lebanon, N. Y., his birthplace, Yonkers and New York, his residences, are chosen as the recipients.

For New Lebanon, one hundred thousand dollars is authorized as foundation for a free library and reading room, and, if possible, for a school for the education of girls. The latter provision shows an appreciation of the tendency of the day.

For Yonkers, the city where he died, the expenditure of the sum of fifty thousand dollars is authorized for the establishment of a free library and reading room.

But for this city the great donation is reserved, to be known as the Tilden Trust. It is to be devoted to the establishment and maintenance of a free library and reading room in New York, and for other scientific and educational objects. The amount of this legacy will be very great, probably four millions of dollars and over.

This bequest is destined to exercise an important in-

fluence on the city. It will tend to make New York one of the library cities of the world. The Lenox collection of Shakespearean and other special classes, the Astor general collection, may all be eclipsed, and the city's literary wealth more than duplicated. Taking four millions as the probable amount of the trust, it will be found that few institutions in this country surpass it.

A wise disposition of the Tilden Trust may create a new scientific and literary life and reputation for New York, and cause its scientific status to rise to a level with its commercial importance.

THE ART OF PITCHING IN BASEBALL.

In answer to our invitation of July 31, we have received a large number of communications discussing the problem of horizontal curve pitching in baseball. We take this opportunity of thanking the writers, and assure them that their letters have received careful attention, though we are unable to publish more than a small number, on account of our limited space.

From an examination of the almost unanimous testimony thus submitted, and from an independent consideration of the problem on its own merits, it appears the horizontal curve is in the same direction that the ball is rotating, and not in a contrary direction, as first stated by our contributor, Mr. Chadwick, in the original article. Consequently, the ball represented in cut A, SCIENTIFIC AMERICAN, July 31, will describe a curve away from the retarded side instead of toward it, or, in baseball parlance, will be an *out* in place of an *in* curve. The diagrams showing the method of giving a rotary motion to the ball have been indorsed by well-known players, and will prove helpful, we think, to those who are trying to master the art of curve pitching.

GOOD AND BAD TAXIDERMAL ART.

From the student of natural science down to the sportsman who looks in at a museum, and tries to identify the curlew he knows so well in the field among the stuffed specimens bearing the same name, there is general, and it may be said just, complaint against the taxidermist. If a skin is to be stuffed according to the amount of cotton or hemp it is capable of holding, and mounted after the taste and fancy of the operator, then the representation of live forms must depend, not upon the natural shape, dimensions, and pose of the original, but upon the condition of elasticity the skin happens to be in when it is treated.

Artemus Ward, in his "Moral Show of Wax Figgers," put the placard, "This is a horse," under a figure resembling the beast, and was wont to explain that he knew it was a horse because the man that made it told him that was what he intended it for.

Stuffed specimens in museums often require similar guarantees, because to those familiar with the species they represent there is little to identify them with their originals.

For the purpose of distinguishing the skillful and conscientious workman from the mere bungler, and raising the art of taxidermy to the place it ought to have among the natural sciences, the American Society of Taxidermists was formed, several years ago. The influence of this admirable society may already be seen in the nicer discrimination evinced by museums and collectors in selecting their specimens. It is no longer a question of how much work a man can do in a day in the taxidermist's shop, but rather of the character of his work; and he who can stuff a pheasant or a starling and preserve its proper dimensions, attitude, and expression, can obtain a greater reward than he who has stuffed three pet cats and four canary birds in the same period of time, without care as to their scientific configuration.

It should, however, be said for the ordinary taxidermist, that he labors under serious disadvantages. The sportsman sends him the skin of a tufted grouse, a sandhill crane, or the like, without supplying the dimensions, which should invariably be taken in the field, when the body is warm, and, as he is not a student of natural science, he models by guesswork. Perhaps he tries to work up to a picture of the bird, and this picture being after a poorly stuffed specimen, as nine-tenths of these pictures are, only serves to mislead him. The skillful taxidermist maintains, and with reason be it said, that only the student of live forms should essay to stuff their skins, else he cannot hope to catch their expressions and reproduce their lines and attitudes.

The Museum of Natural History, in the New York Central Park, like other museums, contains both good and bad taxidermal work. Some of the untrustworthy work was once good, like the Maximilian de Nerwiede collection, but has deteriorated with age, while another portion is presumably bad because the taxidermal work was done by those unfamiliar with the subjects in the live state. The new monkey collection furnishes good circumstantial evidence of this. Some of the specimens are very rare, and their habits and general appearance are little known. The skins are collected by agents of the Rochester dealer, who has contracted to furnish the collection. They are stuffed in whatever the taxidermist supposes to be the real forms of the animals. Naturally enough, he will guess it wrong ninety-nine times out of a hundred, and on the hundredth be four-fifths out of the way.

It is invariably the case that when a rare specimen is finally captured alive, and confronted with his counterfeit presentment, the two seem not in anywise related.

Quite recently a live monkey was brought hither from the upper waters of the Amazon, and offered for sale to the Park Commissioners. It was a rare specimen, none of its kind having been here before—scarlet-faced, yellow-headed, white-backed, short-tailed—and several students of natural science got out their text books and compared descriptions and pictures with the original. According to all these, *the live specimen was altogether wrong in design.* He ought to have been fat and dumpy—a sort of hedgehog with heavy furring and short legs.

In order to avoid this sort of thing as much as possible, the directors of the Museum of Natural History have taken great pains with its taxidermal department, employing only skillful men, who are, at the same time, students. They know the specimens they handle, their habits, measurements, and contours. As a result of this, all the recent work, especially that on the collection of North American birds, is as nearly accurate as is possible when man attempts to imitate nature. Still further efforts are being made just now to furnish these criteria for the investigation of the student and the comparison and information of all others interested in this department of natural science.

PHOTOGRAPHIC NOTES.

Advantages of Centrifugal Action in the Making of Gelatino-Bromide Silver Emulsions.—Upon this subject Mr. A. L. Henderson, of London, recently spoke before the Glasgow Photographic Association as follows, which we take from the *British Journal of Photography:*

The advantages of using centrifugal action for the removal of impurities from emulsion will almost necessitate my referring to the whole operations of emulsion making. Gelatine, as we know, is a very variable substance, no two batches being alike either in purity or hardness, and success depends on the perfection and uniformity of the materials employed, as well as the manner in which they are used. Nothing has yet been discovered that has such a powerful restraining action as gelatine; half a grain per ounce of emulsion will give a finer precipitate of bromide of silver than any saturated mucilaginous solution, and I confess my inability to account for this. I, for one, will hail with pleasure any substance that will not combine with the gelatine in forming a gelatinate or phosphate, or, perhaps, both. It has commonly been believed that the complete removal of the colloid emulsified, and with a renewal of fresh, pure gelatine, all fogging would be prevented. The separator which I have pleasure in showing you to-night will do a great deal to substantiate this common belief, but it will not cure all diseases in emulsion. The most formidable that it will not remove is one that has been affected by light. Green fog and gray fog will be removable, the former entirely, if the centrifugal action is not carried too far, *i. e.*, to complete separation. Green fog is a silver compound, and I think I can prove this. If I submit the green fog to the action of the fumes of hydrocyanic acid, it is removed; if I emulsify with ten grains of gelatine, I get ten times more green fog than if I employed one grain. Green fog being a finer precipitate of silver, it is not so readily amenable to removal by centrifugal action. It may be argued, Why not always use one grain? Well, the answer is very simple: the more gelatine I use, the finer the precipitate, and, as a rule, the slower or less sensitive is the emulsion, but it is quite possible, by the addition of other restraining substances, to greatly assist the small quantity of gelatine to do the work. For instance, acetates, citrates, or, in fact, almost any neutral salt, added to the gelatine or silver, will act, and the result is, not only do we get a finer crystalline form of bromide of silver, but the form is a more sensitive one. Mr. A. Haddon was the first to point out that rapidity depended on the form of crystal. He observed that when a few molecules of silver bromide were placed under a microscope, and heat applied, the crystals rapidly passed from one shape into another, the larger ones absorbing the smaller. I would like to say a little about the purity of the silver and bromide. I have frequently found minute quantities of sulphates therein (a prolific source of pinholes in the negatives). I cure these by the addition of a few drops of a saturated solution of nitrate of baryta, allowing the solutions to stand before filtration. Supposing all the materials were fairly pure, and the emulsion has been made and ripened by any of the well-known methods, another uncertainty is introduced, namely, in washing the emulsion in order to free it from all soluble matter, that the water employed for this cleansing process is not always pure, and by removing one evil we are introducing another, and more particularly decomposing the gelatine, not considering the disadvantage of an ever-varying quantity. By the use of a separator nearly all these difficulties are avoided. Mr. Plener, I think, we have to thank for the idea of suggesting centrifugal action in emulsion making. Mr. Plener, doubtless in ignorance of a previous patent, took out one. To sum up, in a few words, the principal advantages to emulsion makers of this process are: 1. Complete removal of all the salts in an exceedingly short time. 2. That the bulk of emulsion need never vary. 3. That the bulk of gelatine may be melted and filtered before adding to the bromide. 4. That emulsion may be made in weather such as we have had lately with great ease. Most makers suspend operations when the temperature gets near the eighties. 5. That emulsion may be made and in the coater's hands within a few minutes. 6. That the quality is much better. 7. Last, if not least, great economy. Saving of twenty-five to fifty per cent. One firm to whom I have supplied a separator is now saving £40 a month in alcohol.

Drop Shutters.—We have found by blackening the back of the shutter slide with plumbago, such as is used in lead pencils, the slide works perfectly free. The plumbago appears to answer the two-fold purpose of a lubricant and blackening medium.

Abyssinian Economic Productions.

Among the vegetable articles of diet of the Abyssinians, the first place is taken by *teff* (*Poa abyssinica*), a herbaceous plant, whose grains are as small as a pin's head; the meal from this forms the bread in general use. A much inferior black bread used by the poor is made from a kind of millet called *tocusso* (*Eleusine tocusso*), frequenting the low grounds. In addition, the roasted seed of the flax plant (*Linum usitatissimum*) is sometimes eaten, as it was by the ancient Romans and Greeks. Another admired vegetable is the flower stalk of the local plantain, called *ensete* (*Musa ensete*), the fruit of which is dry and unfit for eating. The stem is cooked with milk and butter. It is cut off just above the rootlets, and about two feet high. If old, the green outer coat is peeled off till the white interior shows. It is as tender as a well cooked turnip, with a flavor like the best new bread somewhat underdone. It is an excellent dish, nourishing, wholesome, and digestible. From meal cakes a fermented drink called *bousa* is made.

The coffee grown in Abyssinia is principally sent to Djedda and Upper Egypt; though not of first rate quality, it possesses a special aroma, and is sold at the rate of $16 per *cantaro* of 113 *rottoli* (say 37s. per cwt.).

The women of Gurage make mats of the leaves of the *ensete.* The *ecca* of the Abyssinians, a species of asclepiad, produces a tough fiber, used in making cordage and tissues on the Red Sea littoral. The bark of *Calotropis gigantea* affords excellent fiber, used for various purposes. The tender leaves newly pulled from the stipa of the *doum* palm are woven into all kinds of matting and basket ware. The powdered seed of a large tree called *berebera* (*Milettia ferruginea*) is thrown into the water to stupefy fish and facilitate their capture. The native dress consists of a large folding mantle and close-fitting drawers. The houses are rude conical structures, covered with thatch.

Among the local products figuring in the exports are: Calves' hides, salted and sun dried; beeswax, chiefly from Gedaref; ivory, tamarinds, ostrich feathers, gutta percha, from Kassala; gum arabic, mother-of-pearl, leopard skins, about 1,000 annually to India; musk, contained in bulls' horns, to the number of 200 to 300 a year; honey, and tobacco, chiefly from Sanaaid.

Kauri Gum as a Medicinal Substance.

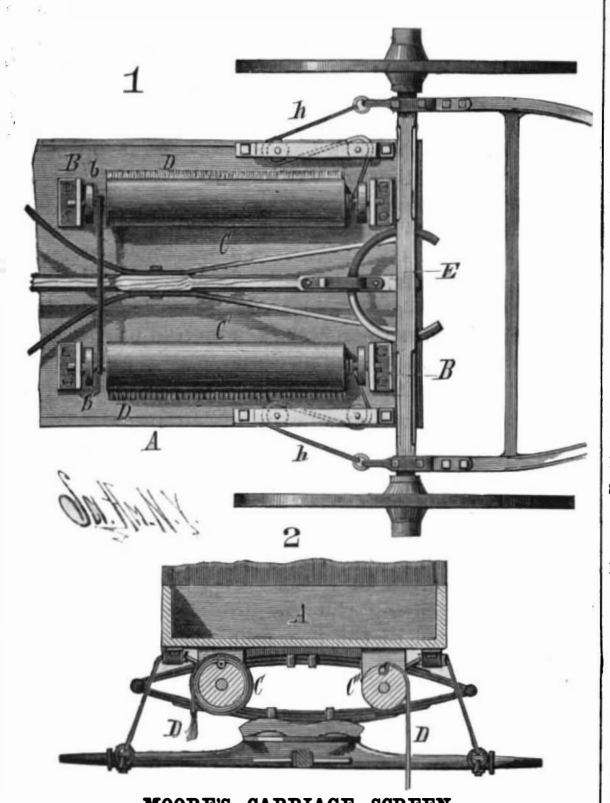
Many years ago Dr. Hammond, of Bournemouth, presented me with a fine specimen of kauri gum, which one of his sons had brought from Auckland, in New Zealand. In experimenting with the gum thus supplied, I have found that it may be made to perform many useful services in medicine. When the gum is burned—and it burns briskly—it gives out a very pleasant odor which destroys the odor of putrefying organic substances most effectively. Dissolved in spirit, it makes a fluid which burns in the lamp with good effect. Reduced to a fine powder and shaken with water, it communicates to the water new properties, so that, sprayed in a room, it renders the air ozonic. It mixes well with ointments, forms a good combination with soap, and, combined with iodine, is a useful deodorizer and disinfectant. The gum is from a pine, the kauri tree, *Dammara australis.—The Asclepiad.*

Large Planing Machine.

Messrs. Killock & Galbraith, engineers, Glasgow, are at present constructing a planing machine, to the order of Messrs. William Arrol & Co., the eminent contractors of the same city, which is said to be the largest of the kind ever made. When finished, this machine will weigh 35 tons, and it is to be capable of planing the edge of a plate of 38 ft. in length by 5 ft. wide. It is specially intended to be employed in connection with the preparation of steel plates for the girders of a railway bridge which is about to be erected across a river in New South Wales.

CARRIAGE SCREEN.

The object of the invention herewith illustrated is to provide screens to be operated by the forward axle of a carriage when turned or cramped, for screening from the view of bystanders the limbs of persons entering the carriage or descending from it. The rollers, C C', are placed in hangers secured to the floor of the body, as shown in the inverted plan view, Fig. 1, Fig. 2 being a cross section. Between the ends of the rollers and hangers are disks, *bb'*, and on the spindles between



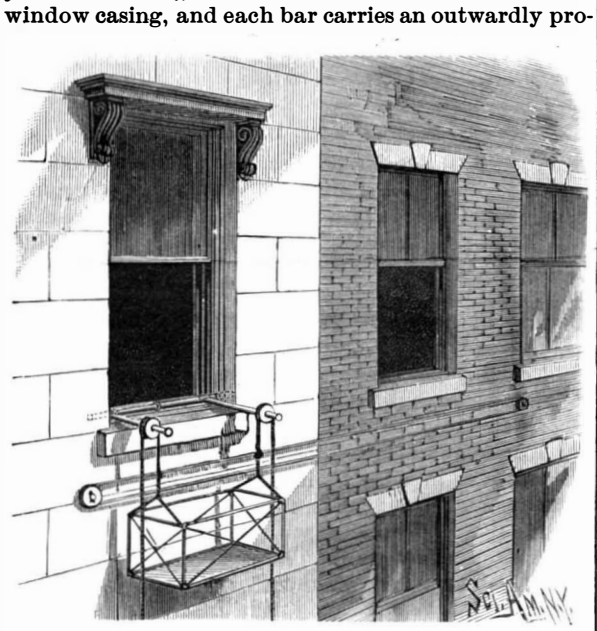
MOORE'S CARRIAGE SCREEN.

the disks and rollers are thus formed spaces for receiving cords. The screens are held to the rollers by means of spring clips. A rubber cord or spring is so arranged as to rewind the screens when they are released. Around the spindle of each roller is wound a cord, *h*, which is led around pulleys as shown, and attached to the outer part of the forward axle. These cords are oppositely arranged with respect to each other, so that when the axle is turned the cord of the advancing end of the axle will be pulled and unwound from its spindle, thereby causing the roller with which it is connected to turn in a direction to unroll the screen, while the cord connected with the opposite end of the axle will be rendered slack, thus allowing the rubber spring on the roller connected with that end of the axle to wind up the screen. In this manner, whenever the wagon is cramped to permit a person to enter or leave it, the screen is automatically unrolled.

This invention has been patented by Mr. W. M. Moore. Further particulars may be obtained from Messrs. Hanchett & Moore, of Empire City, Colo.

FIRE ESCAPE.

The outer ends of two bars united by a telescopic joint are arranged to enter sockets formed in the window casing, and each bar carries an outwardly pro-



FOGARTY'S FIRE ESCAPE.

jecting arm, upon which a sheave is mounted. The inner ends of two wire ropes, passed over the sheaves, are attached to a car made of piping, and the other ends are within reach of persons standing upon the ground. By means of this device, which may be quickly put in position at any window, persons may be easily raised or lowered; and by means of the horizontally placed wire rope, which passes over suitable pulleys, as shown, goods or persons may be passed from one house to another, and when necessary this rope may be arranged between windows not upon the same level. The simplicity in construction and the ease and rapidity with which this fire escape can be operated are apparent.

This invention has been patented by Mr. Patrick Fogarty, of Milwaukee, Wis.

One and One-quarter Pound Boats.

On the 24th of July the new screw steamer Somali, recently built by Messrs. Murdoch & Murray, Port Glasgow, and engined by Messrs. J. Gilmour & Co., Glasgow, had her official trial trip at Wemyss Bay, on the Clyde. She is a vessel measuring 160 ft. by 26 ft. by 10 ft. 9 in., and is intended chiefly for employment in transporting the native troops from depot to depot (as required by the Indian Government), together with passengers, pilgrims, cattle, and goods. Her engines are of the triple-expansion type, the cylinders being respectively 13½ in., 21 in., and 34 in. in diameter, with piston stroke of 24 in., and working at a steam pressure of 150 pounds per square inch. Her fittings and arrangements for artificial ventilation are very complete. On the measured mile, and at high water, the speed developed was 10 knots per hour, the engines indicating 395 horse power, with 110 revolutions per minute, at a pressure of 145 pounds per square inch, and the vacuum at 27 in. The fuel consumption was at the rate of 5 tons of good coal per 24 hours, or 1¼ pounds per indicated horse power per hour. After running the measured mile twice she proceeded on her voyage with a full cargo for Aden. She is owned by the Somali Company, of Liverpool.

July 31, the magnificent steel screw steamer Saale, the eighth vessel built by the Fairfield Shipbuilding and Engineering Company for the North German Lloyd's, had a trial of her steaming powers on the Clyde, the run extending from Wemyss Bay to Ailsa Craig and back. She is a vessel of 5,400 tons, measuring 455 ft. by 48 ft. by 36 ft. 3 in., and is fitted with triple-expansion engines of about 8,000 horse power. A speed of nearly 18 knots per hour was obtained, the fuel consumption being only 1·4 pound of Scotch coal per indicated horse power per hour. The boilers are of steel, and six in number, working at a pressure of 150 pounds per square inch. The vessel is constructed to carry 224 first class, 94 second class, and 850 third class passengers, with a crew of 170. Eight first class steamers, of which the Saale is the last, have been placed on the Atlantic within five years.

Natural History at Central Park.

Several fine specimens of the "masked" quail, a newly discovered species, have arrived at the Museum of Natural History, Central Park, New York. The species is called "masked," or Arizona Bob White (*Colinus ridgwayi*). The male is colored below like a robin, while the adult female is lighter or grayer.

The masked quail is properly a Mexican bird, being found only in the southern portion of Arizona. It has, however, been long known in Arizona, but mistaken for the Bob White of the East.

A live specimen of the scarlet-faced monkey, a rare and curious species, and the first of its kind ever brought here, has been on private exhibition in the Zoological Collection at Central Park for several weeks. There being no available funds for its purchase, it was sent last week to the Philadelphia Zoological Garden.

His face is a bright scarlet; the top of his head is gray, the back vermilion, and long grayish whiskers grow under his chin and curl up over it. The coloring is so bright that, when first seen, the animal looks as if he had been daubed with paint.

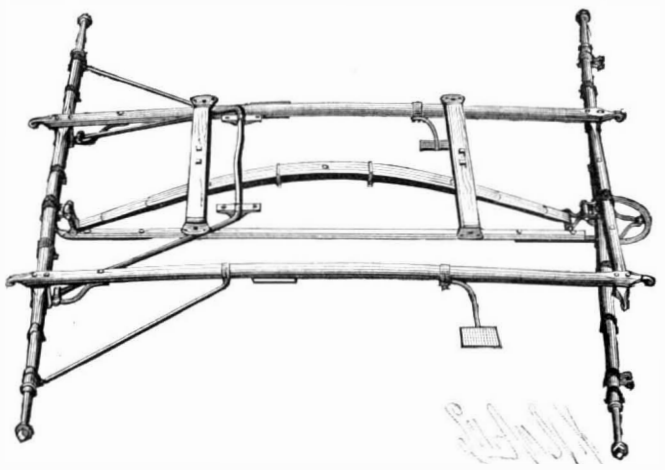
The scarlet-faced monkey, or, technically speaking, the *Brachyurus rubicundus*, is, as its name would denote, short-tailed as well as red-faced, and is comparatively new to the naturalist. It is found near the upper Amazon, in South America, and when several stuffed specimens were taken to England, a year or two ago, it was supposed, so general is the long tail among monkeys, that these specimens had been partly denuded of tail in order to make them appear the more curious. It is definitely known now that this was not the case, and that the scarlet-faced monkey has only a rudimentary tail. The animal has reddish-yellow eyes, and its body, from neck to flank, is covered with long whitish hair. There is another species, of which specimens have not yet been obtained, which has long red hair.

Superintendent Conklin, of Central Park, has made a "wallow" for the herd of twelve elephants now there, and every afternoon one of the keepers turns a hose on to the animals, much to their delight. They have come to understand the use of the hose, and each, in turn, comes up to take it with his trunk and turn it first upon himself and then upon his mates.

When the "wallow" is filled with water, the hose is removed, and the animals spend the balance of the day rolling about in the mud.

IMPROVED SINGLE SPRING FOR VEHICLES.

The illustration herewith shows a means of arranging a single spring for four-wheeled vehicles in such way that, when the box and spring are depressed, both sides of the box must be depressed equally, whether the load is located in the center of the box or not. The front and back axles are connected by the reach in the ordinary way, and upon the front axle is a bolster connected with the rear axle by the side bars, the bolster and the rear axle having each a shackle, to which the ends of a flat upwardly curved spring are secured, the box or body of the vehicle being attached to the spring by suitable bolts and plates. The equalizer is a bail-shaped iron rod, the middle portion of which is pivoted at each side to the under side of the body, in rear of the attachment of the spring, and the wrists of which are journaled in boxes formed upon the irons which brace the side bars to the rear axle. Constructed in this manner, the vehicle is a practical one in all respects, and is cheap and durable.



SCHIEDT'S VEHICLE SPRING.

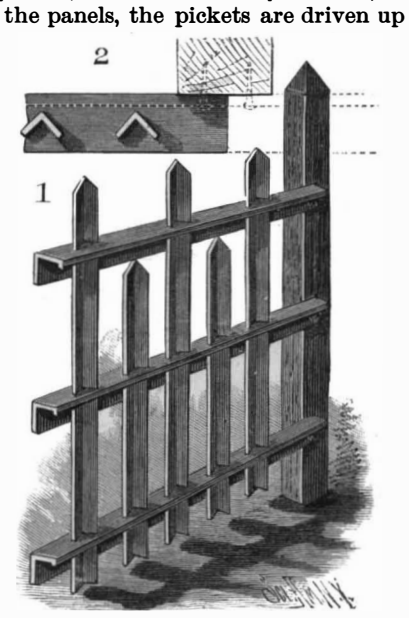
This invention has been patented by Messrs. Peter and Charles Schiedt, of Saranac, Mich.

Bakusine.

The patent of Herr Albert Muller (described in the *Chemiker Zeitung*) consists in mixing 100 parts of petroleum or crude naphtha and 25 parts of castor oil, or any other vegetable oil, with 60 to 70 parts of sulphuric acid at 66° B. The whole is well stirred, and is mixed with two or three times its own bulk of water. After standing for some time, the watery layer underneath is removed. The whole is let stand for some days, and is carefully neutralized with soda or potash lye. The lubricant thus produced (known as bakusine) is then packed in casks or cases.

SHEET METAL PICKET FENCE.

This light, durable, and simple sheet metal picket fence is the invention of Mr. John H. Crisp, of 519 Clinton Street, Chambersburg, Trenton, N. J. The bodies of the horizontal rails, which are shaped as shown in the perspective view, may be placed horizontally or may have a slight lateral inclination. In the bodies are formed V-shaped slots to receive similarly shaped pickets, as shown in the plan view, Fig. 2. In forming the panels, the pickets are driven up through



CRISP'S SHEET METAL PICKET FENCE.

the slots, thereby forcing the V-shaped tongues of the slots upward. When the pickets have been forced into place, the tongues are driven back into the planes of the bodies of the rails, so as to firmly clasp the pickets. The completed panels are then galvanized, the galvanizing material filling the joints, and acting as a solder to further secure the pickets in place. The ends of the rails are nailed to the post, or the ends may be bent at right angles and nailed to a post set in the line of the fence.

COAL RECEPTACLE.

The accompanying engraving represents a coal receptacle which effectually prevents the escape of dust into the apartment wherein it is placed, and yet permits of the easy withdrawal of the coal by means of a shovel. The bottom of the main body of the receptacle is curved downward from the forward side, and then upward to meet the rear wall. At a point just upon a level with the forward edge of the bottom there is a door; and just above the opening that is closed by the door, there is a rearwardly inclined partition, shown in Fig. 2, which does not extend entirely across the box. Below this partition is arranged a deflecting plate held to the rear wall. Fitted within the main receptacle is an extensible section, which may be held

NIEHOFF'S COAL RECEPTACLE.

in any desired position by means of a set screw. The position of the partition and deflecting plate prevents the coal from extending to the bottom of the door, but permits a quantity to always rest upon the curved floor. The receptacle shown in Fig. 3 is designed particularly for use in flats and apartment houses; it can be made to hold a large quantity of coal without occupying much space in the room.

This invention has been patented by Mr. Henry Niehoff, of 74 West 53d Street, New York City.

ASH SIFTER.

The inclined box-shaped flue communicates at its lower end with a hollow base, in which are two drawers, one to receive the sifted coal and the other the fine ashes. Extending entirely across the flue is an inclined sieve, whose lower end rests on a partition between the two drawers. The lower end of the sieve has lips, one of which causes the ashes to be deflected into its drawer at a little distance from the edge, and the other abuts against the middle partition. On the surface of the screen are various deflectors, which cause the coal and ashes to be agitated through a tortuous course in their passage. In the top of the flue is a circular opening, around which fits a funnel-shaped hopper, the opening in the bottom of which is provided with a valve,

MILLNER'S ASH SIFTER

which may be pulled up by a chain to allow the contents of the hopper to be discharged through its bottom. The hopper also has a bail and cover, so that it can be used as a portable ash bucket. This construction obviates the necessity of transferring the ashes from a bucket to the hopper, and the ashes may be transferred and sifted in a tightly closed case, thereby preventing all escape of dust.

This invention has been patented by Mr. G. W. Millner, of Charlottetown, Prince Edward Island, Canada.

The Decline of Flour in Price.

According to statistical records, the average price of wheat flour exported from the United States, for periods of eleven months ending with May of this year and twenty years past, has been as follows:

Year.	Price per 1,000 bbls.
1886	$4,749
1885	4,897
1884	5,588
1883	5,956
1882	6,149
1881	5,669
1880	5,878
1879	5,252
1878	6,358
1877	6,479
1876	6,208
1875	6,001
1874	7,146
1873	7,565
1872	7,141
1871	6,594
1870	6,112
1869	7,735
1868	10,061
1867	8,428

The movement has been steadily downward since 1866, excepting in several years when extraordinary causes checked the decrease. The bottom is reached in 1886, and now there are signs of an upward move that will accomplish a partial retrieval of the loss of the period mentioned.

Luminous Stone.

Messrs. W. C. Horne and E. Ormerod, of London, England, have recently invented a method of utilizing the luminous powder prepared mainly as a sulphide of calcium, for admixture with cements, plaster of Paris, and concrete, the object being to prepare the articles with a self-contained phosphorescent property instead of coating them with luminous paint. They take the proper proportion of any suitable cement, with the right amount of the luminous powder, mixing these with water, and moulding it to the required shape in the usual way, after which it is laid on the ceilings or walls with a trowel. The patentees attach importance to placing the moulded articles as soon as dry in a bath of paraffine wax and benzoline, or other waterproofing substance equally good.

In the case of using the luminous cement upon a wall or ceiling, they sponge or brush the surface over with a solution of paraffine wax and benzoline or other suitable damp-proofing solution. The uses of a luminous cement are manifold, *e. g.*, for the garden—luminous concrete, as edging to garden paths and carriage drives, for guides and beacons at the entrance gates of drives, insides of stables, the base of balustrades, or the entirety of balustrades; for roads—as luminous beacons of corners of dark country lanes, and at the ends of bridges, ends of walls, and curbs of footpaths; for docks—for edging of piers and wharves; for waterworks—for the safety and dispatch of night work by the erection of luminous guides and beacons, and for fire plug notices on walls. In short, for any place where the light of day will sufficiently excite the phosphorescent property as to render the cement or concrete work luminous by night.

Lecture Experiment.—The Ferrates.

BY C. L. BLOXAM.

The ordinary prescriptions for preparing potassium ferrate are not well adapted for lecture illustration. It may be obtained quickly by placing a fragment of potassium hydrate in a little solution of ferric chloride, adding a few drops of bromine, and, if necessary, gently heating; the resulting dark brown mass dissolves in water, yielding a fine red solution, which resembles the permanganate in its power of coloring a large volume of water, and may be kept for many hours without decomposition. Barium chloride produces a heavy purplish red precipitate of barium ferrate, leaving the liquid colorless.

A fine red solution of calcium ferrate is obtained by adding a little ferric chloride to bleaching powder, and boiling with water. This solution also gives a purple precipitate with barium chloride. It is bleached by filtering through paper. It is well known that many samples of bleaching powder yield a light pink solution when boiled with water, from the production of calcium ferrate. Manganous sulphate destroys the pink color, and barium chloride precipitates the ferrate.

King's College, London, July 16, 1886.

—*Chem. News.*

Oil on the Water.

Another instance of the marked benefits resulting from the use of oil on troubled seas was afforded by the recent experience of the steamship Werra, of the North German Lloyd's Line, which was disabled in mid-ocean during her last transatlantic voyage. The steamer had been taken in tow by the Venetian, and all went well until the evening of August 3, when a strong gale prevailed and heavy seas were constantly breaking over the bow of Werra, endangering the tow lines, and threatening the loss of the tow. The captain of the Venetian caused an oil bag to be hung from each side of his vessel and dragged some distance astern. The result was almost immediate, and the sea became comparatively smooth around the disabled ship. The officers of the Werra were for some time ignorant of the cause of their relief. At the exchange of signals on the following morning, they reported that after the oil bags had been hung out, their vessel experienced much better weather, not a drop of water breaking on board, and the ship being in all respects more comfortable.

HEAD REST FOR CHAIRS.

The upper portion of the head rest is covered with upholstery, and is slightly curved so as to form a comfortable support for the head. To the under side of the block is fixed a plate, having four guides which

BUSTARD & SNAPP'S HEAD REST FOR CHAIRS.

range toward the center. In each guide is a jaw held in place by a screw. In the center of the plate is a socket, in which fits a ball held in place by the jaws. The ball is carried by a rack bar, which may be held at any desired height by a properly arranged pawl. It is obvious that when the head rest is fixed at the back of a chair, the top will move very easily backward or forward, or to either side, or at any angle upon the ball, to accommodate the position of the head of the person sitting on the chair.

Further particulars concerning this invention may be obtained from Messrs. Bustard & Snapp, of Stephenville, Texas.

CHIMNEY COWL.

This chimney cowl is designed to prevent the downward draught and increase the upward draught in a chimney. Supported by standards above the chimney is a conical cap, from the center of which a tube projects downward. This tube forms a bearing for a spindle whose lower end is secured to a cowl shield shaped as clearly shown in the engraving. The weight of the spindle is carried by a ball bearing placed at the top of the conical cap. The upper end of the spindle carries an arm, to which is attached a vane. With this construction, the wind blowing across the chimney top so directs the cowl shield as to produce a partial vacuum under it and in the chimney top, thereby increasing the up-

CLIFFORD'S CHIMNEY COWL.

ward draught. An aperture in the flange of the cowl shield allows a jet of air to pass under the shield to further increase the draught. It will be observed that the bearings are removed from the chimney, so they will not be affected by the acids contained in the smoke. This arrangement insures the free movement of the vane, and renders the bearing surfaces very durable.

This invention has been patented by Mr. Neal Clifford, of 419 Franklin Street, St. Joseph, Missouri.

D'Arsonval's Chronometer with Magnetic Escapement.

The following translation of M. D'Arsonval's memoir, recently presented to the Paris Academy of Sciences, is given by the *Electrical Review:* The apparatus which I have the honor of laying before the Academy has been designed at the instigation of my master, Professor Brown-Sequard, who wished, with my assistance, to resume his former experiments on the rate of the transmission of sensitive impressions through the spinal marrow in a normal or in a pathological condition. My distinguished master was, in fact, the first to show, in 1859, that a sensitive impression undergoes a considerable retardation in its passage through the spinal marrow. Subsequently a great number of physiologists (Helmholtz, Bast, Chauveau, Marey, Hermann, etc.) have measured with great precision the absolute speed of the nervous agent in the nerves.

The procedure generally employed by physiologists, especially since the researches of Marey, is application of the graphic method, which owes so much to this author. A smoked cylinder, moved by a Foucault regulator, receives two parallel traces; the one, which gives the time in hundredths or thousandths of a second, is a sinusoid traced by the vibrations of a diapason. The second trace, which marks the beginning and the end of the phenomenon, is given by a Marcel Deprez electro-magnetic signal or by the pen of Marey's lever drum. This method is faultless as regards precision, but it requires a previous training and a series of operations which cannot be expected from a hospital surgeon, and still less from a medical man in his private practice.

The apparatus which I am about to describe gives the time in tenths of a second like an ordinary chronometer, by the simple displacement of a needle on a scale without employing the graphic method. It is essentially composed of a piece of clockwork provided with a Foucault regulator, which causes an axle, ending in a small circular plate of 12 millimeters in diameter, and covered with a thin sheet of caoutchouc, to make exactly two revolutions per minute. Opposite this plate, and at the distance of one millimeter, there is a second plate of tinned iron, of the same dimensions and parallel to the former. This second plate terminates a small, very short axle, carrying at its other end a thin aluminum wire at right angles to itself. This aluminum wire serves as a finger, and moves on a scale divided into 50°. An antagonistic spring constantly pushes the tin plate against the plate of the movable axle; under this pressure the two axles form one, and the aluminum needle turns round the scale with the speed of two revolutions per second. A small electro magnet is behind the tin plate, which serves it as a keeper.

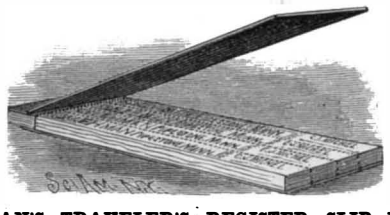
If a current is directed into the electro magnet, the disk of tin is attracted, it becomes separated from the revolving plate, and the aluminum finger is rendered motionless on the scale as long as the current passes. At the moment of the rupture of the circuit, the antagonistic spring produces the escapement, and the finger sets off instantly at the speed of two revolutions per second. The extreme lightness of the pieces and the nature of the electro-magnet render the time lost similar to that in the electro-magnetic signal of M. Marcel Deprez. The displacement of the finger on the scale measures the time during which the electric current is interrupted, in hundredths of a second. Hence to measure the speed of an impression the arrangement required is most simple.

The experimentalist touches the subject with a small manipulator consisting of a spring bearing upon a point. At the moment when contact with the skin takes place, the spring abandons the point, the current is broken, and the finger sets off from zero at the speed of two revolutions per second. The subject holds in his hand an electric stop, upon which he presses as soon as he feels the impression. This pressure reopens the current, and consequently stops the finger by actuating the electro-magnet. The time which has elapsed between the moment of excitation and that of perception is thus found given in hundredths of a second by the movement of the finger on the divided scale. This little apparatus, very ingeniously constructed according to my indications by M. Ch. Verdin, is of minute dimensions; it is contained in a circular box of 20 cm. in diameter by 6 in thickness. Its small bulk and the ease of its use render it an essentially clinical apparatus, calculated in many cases to throw a light upon nervous pathology.

This, however, is not the limit of its utility. It is equally calculated to be of service in measuring phenomena of short duration, measurements which we are reluctant to undertake by the graphic method. M. Brown-Sequard will shortly lay before the Academy very interesting and novel results already obtained.

ADHESIVE ADDRESS TAG FOR TRAVELERS.

The accompanying illustration shows the idea of a recently copyrighted book of addresses, intended for the use of travelers. Instead of writing the name in a hotel register, one simply tears out a slip and pastes it in place. This method also serves, where desired, to afford the means of making a conspicuous advertisement, such as a traveling salesman might like to employ on behalf of the house he represented.



EHMAN'S TRAVELER'S REGISTER SLIP BOOK.

This book has been copyrighted by Mr. C. W. Ehman, of Pipestone, Minn.

THE STAR PORTABLE FORGES.

Mr. C. Hammelmann, the patentee of all forges made in Buffalo, N. Y., so far as we know of, has, after long study and having noted the vulnerable points and defects in his early inventions, produced a portable forge which, in its mechanical arrangements, is very much superior to any former ones. On this page we give cuts of this forge and blower, known as the "Star Portable Forge" and blacksmith's hand blower. Many admirable features are introduced, which increase in every way the general efficiency of the device. The number of working parts has been so reduced that the construction is extremely simple, thereby lessening the friction to be overcome in a corresponding degree. There is only one large wheel, over which passes the belt driving the blower. The method of operating the band wheel is simple and ingenious, and there is no liability of getting out of order. This wheel is driven by a rack, which has an up and down motion in guides attached to the legs of the machine, and which engages with a pinion on a clutch mounted on the main or driving shaft. This shaft is so arranged that any wear of the pinion and rack can be taken up by means of set screws. The rack is operated by a lever hung on a swivel, so that the worker is permitted to move about on a considerable radius. It is evident that, owing to the direct method of applying the power, and the minimum amount of friction, almost all of the force applied to the lever is transmitted to the blower. The clutch has very few pieces, and is so designed that there is practically no wear. Another advantage is obtained by the employment of steel shafting and by babbitting the journals.

Fig. 1.—THE STAR PORTABLE FORGE.

Fig. 2.—THE STAR BLACKSMITH'S FORGE.

The forge shown in Fig. 1 is adapted to the use of machinists, plumbers, gas fitters, and manufacturers in general. In this size, which will produce a welding heat on 2½ inch round iron in six minutes, the fan is 8 inches in diameter, the hearth 21 inches in diameter, the height of fireplace 34 inches, and the weight 110 pounds.

The forge shown in Fig. 2 is especially adapted for heavy blacksmith work, having a large fireplace, with sufficient blast to do the heaviest kind of work. It will heat 4 inch round iron in ten minutes. The fan is 14 inches, the hearth 30 by 40 inches, the height 30 inches, and the weight 265 pounds. This forge has been used by carriage and wagon blacksmiths, and has given great satisfaction. It saves time, occupies but a small space, and is more convenient and effective than brick forges and bellows.

The manufacturers of these forges, the Star Machine Company, of 198 and 200 Terrace, Buffalo, N. Y., also make all the usual styles and shapes of forges and blowers, and in each one the same essential principles are embodied. It will be seen that this company, owing to the reduced number of parts and labor necessary to make them, can place a first-class machine upon the market at a reduced cost.

Balloon Voyage from France to England.

M. M. L'Hoste and Joseph Mangot, the latter a famous French astronomer, and the former being secretary of L'Academie d'Aerostation Meteorologique de France, have lately made a balloon voyage from Cherbourg, in France, to Tottenham, a suburb of northern London, near Alexandra Palace, a feat that would be deemed impossible were it not for the actual proof. M. L'Hoste, who is quite an enthusiastic aeronaut, has long conceived the feasibility of directing a balloon to the point intended for arrival or utilizing it for dropping torpedoes. It was their intention to alight in Finsbury Square, five miles from the place where they did stop; the steering apparatus worked all right, however, and the balloon kept in a uniform northeasterly direction.

The main object was not so much an experiment, to prove the power and accuracy of steering, as to ascertain the possibility of maintaining an equable altitude above the waves in crossing the water. This was done by means of a pipe extending into the waves, and by means of which water could be drawn up to be used as ballast in counteracting the condensation by rarefaction of the gas which causes balloons to shoot upward. It worked quite well, keeping the balloon about 150 feet above the surface until the Isle of Wight was reached, when it shot up, but the water ballast is always under control, an advantage unobtainable with bags of sand.

The trip occupied twelve hours, and was successful in every particular, the French newspapers attaching much importance to the feat, on account of military and scientific benefits.

Yellow Azo Dyes for Cotton.

The *Allgemeine Zeitschrift fur Textil-Industrie* describes a range of azo dyes invented by the St. Denis Manufacturing Company, which impart a fast yellow color to vegetable fibers. By the action of metadiazobenzol acid upon diphenylamine or monobenzylaniline, there is produced a pure yellow dye; an orange-yellow being obtained by the use of paradiazobenzol acid. In order to use these two acid dyes in cotton printing, they are first brought into their respective salts by soda, potash, or ammonia, and are then thickened in the usual way with starch and tragacanth. After boiling and cooling, an excess of acetic acid is added to the printing color, by means of which the dye (finely divided in the thickening) is again expelled in its original form. Finally, a certain quantity of acetate of chrome is stirred in, and the color thus composed is printed upon cotton, steamed, washed, and soaped at 144½° F. By replacing acetate of chrome with an alumina mordant, greater brilliancy is obtained, but less solidity. The color with chrome mordant can also be used and printed with artificial alizarine.

Cincinnati Industrial Exposition.

The Exhibition of Industry and Art to be held this year at Cincinnati, from September 1 to October 9, will be the thirteenth of a very highly successful series of expositions inaugurated in that city in 1870. The last exposition attracted exhibitors from twenty-nine States and four Territories, as well as from numerous foreign countries, and was attended by nearly a third of a million visitors. It is expected that the present occasion will be even more popular, and every provision has been made for its success. The accommodations of the city are ample, and will be furnished at ordinary rates. A very commendable feature of the Cincinnati expositions is the absence of any private interests. They are managed entirely in behalf of the citizens, and are under the control of the Board of Trade, Chamber of Commerce, and Ohio Mechanics' Institute. Mr. Edwin Stevens is the president of the Board of Commissioners for the present year.

Correspondence.

THE ART OF CURVE PITCHING.

To the Editor of the Scientific American:

I notice in your last number (July 31) a paper on "The Art of Pitching in Baseball." Being myself slightly acquainted with both the science of baseball and of physics, I should like to state a theory which, although neither new nor original, I think explains correctly the phenomena of curved baseball pitching.

The article mentioned states, in substance, that the horizontal rotary motion given to a ball as it is thrown from the hand of the pitcher generates, as it passes through the air, more friction on one side of the ball than on the other. This unequal lateral friction, the author states, causes "a curve in the line of its delivery in the direction of the side on which its progress has been retarded."

If this were the case, this theory, as stated in your columns, might be a sufficient explanation to the casual observer. But if we examine the subject practically, we shall find that a baseball curves in the same direction in which its face or forward half is rotating; and *not*, as stated in the article, toward the side of greatest frictional resistance.

A simple experiment will be sufficient to show plainly the direction in which a ball curves while under the influence of these two horizontal motions.

Take a ball of yarn and an empty spool, run a piece of heavy wire through the axis of both, suspend this device by a long piece of thread from the ceiling (Fig. 1). We have now a pendulum, the ball of which

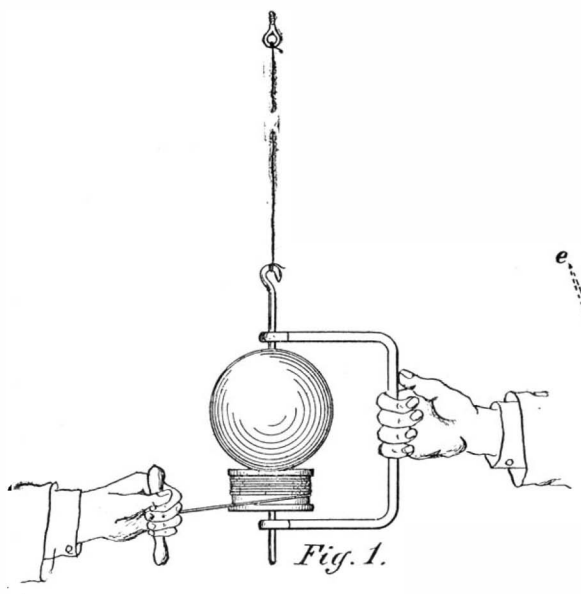


Fig. 1.

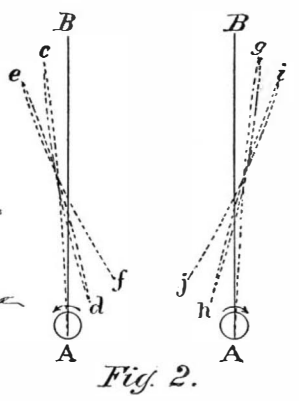


Fig. 2.

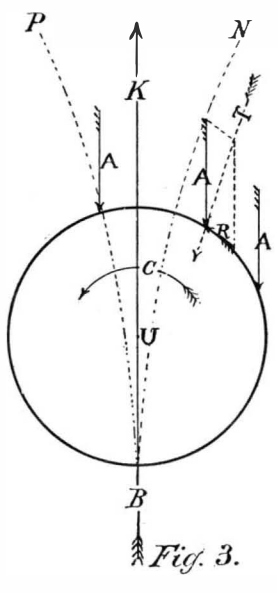


Fig. 3.

can be made to rotate in either direction by simply winding a stout piece of string about the spool and drawing this off suddenly, while at the same time the two ends of the wire axis are held by a piece of wire bent as shown.

Let us now imagine the eye of the observer to be at the point in the ceiling from which the pendulum is suspended. Looking down from our elevated position on the ball as it swings without rotary motion, we will see it apparently describe a straight line as it vibrates to and fro. If, now, we start the ball swinging in a straight line, at the same time giving it a rapid rotary motion about its own perpendicular axis (by quickly drawing off the string wound about the spool), then we shall see that the ball does not traverse back and forth as on the straight line, A B (Fig. 2), but moves in a curve, A*cdef*, etc., or A*ghij*, etc., depending on the direction in which the ball is rotating. We conclude from this experiment that a ball curves in the direction in which the forward half is rotating, and not toward the side of greatest frictional resistance. If we next examine the forces acting upon a ball in its flight through the air, we will easily be able to discover the origin of the force which tends to deflect it from a straight line.

Let Fig. 3 represent a ball moving through the air in the direction of the arrow, B K, and at the same time revolving about its vertical axis, U, in the direction of the curved arrow, C. Let A A A represent the retarding action of the air acting on different points of the forward half or face of the ball. The rotary motion, C, generates a *current of air* about the periphery of the ball, a current similar to that caused by the revolving flywheel of a steam engine.

If, now, at a point on the face of the ball we let the arrow, R, represent the direction and intensity of this *rotary current* of air, and if at the same point we let the arrow, A, represent the direction and intensity of the retarding action of the air, then we will find by constructing a parallelogram of forces that the resultant or combined effect of these two currents acts in the direction indicated by the dotted arrow, T. In other words, we have a sort of compression, or force of air, acting on the face of the ball in the direction indicated by the arrow, T. This force, as we can readily see, tends, when combined with the original impetus given to the ball, to deflect or cause the ball to curve in the direction of the dotted line, B P, instead of maintaining its right line direction, B K. If the ball rotate about its vert axis in the *opposite* direction, the curve, B N, will be the result.

The remarks in the article, in regard to the handling of the ball to produce the required curves, seem to be perfectly correct; but I think, on examination, you will readily see how the theory and practice as there set forth do not hold together. S. M. C.

New York, August 3, 1886.

Kilauea Again Active.

To the Editor of the Scientific American:

I have been spending a few weeks at the Volcano House, crater of Kilauea, Hawaii, and while there I read a leading article in your valued journal giving a brief account of the extinction of the fires in the grand old volcano. As I had the pleasure of seeing the liquid lavas return to the great pit covered by the "breakdown" of last March, and for two weeks after they were seen again watched their gradual increase, I thought you might be pleased to publish the fact—for such it is—of the renewal of activity at that spot.

From careful observations made almost daily for four weeks, I am persuaded that the liquid contents of the great lava lakes, which disappeared at the time of the collapse of the walls of the pit in which they were seen, did not go far from their surface home, as there exist now in the great floor of the caldron—which is about nine miles in circumference—huge caverns, some of which are over a hundred feet in depth and fifty or sixty feet in diameter. I think it but reasonable to suppose that one or more fissures opened suddenly in this floor, and through these the liquid lava disappeared. There has been no outbreak of lava from the sides of the mountain of Mauna Loa, on whose flank, at an elevation of 4,440 ft., the caldron of Kilauea is located; and as the molten lava formed a lake in the midst of the sunken pit on the 1st of this month, and two others broke out near the first one, on the 9th, and as all three have been increasing in size since then, I think you can safely say that Kilauea is once more active. The greatest living crater in the world is again displaying all the wonderful phenomena of intense volcanic energy, and that, too, at points where it can be seen in absolute safety and comfort.

F. L. CLARKE.

Honolulu, H. I., July 23, 1886.

A Problem for Astronomers.

To the Editor of the Scientific American:

At 8 o'clock on the evening of September 20, 1877, I observed that the moon, Saturn, and Mars were at such positions in the heavens that they formed the apices of an equilateral triangle, the moon being nearly full and forming the upper apex, while Saturn and Mars were in the same horizontal line, the first toward the north and the second toward the south. The angular value of the sides of the triangle was 7°. I should like to know when these three heavenly bodies will be again in the same relative positions.

Several solutions have been attempted, but as they do not agree, and I have also failed to make one myself that is satisfactory or susceptible of demonstration, I wish very much that some of the readers of your journal would work out the problem, as well for my individual gratification as for that of others who are interested in the mathematics of the most sublime and beautiful of all the sciences.

J. B. TAPSCOTT, C.E.

Clarksville, Tenn., June 7, 1886.

THE amount of pressure per square foot with the wind blowing at 20, 30, 40, 50, 60, 70, and 80 miles an hour is espectively 2, 4½, 8, 12½, 18, 25, and 32½ pounds.

M. Pasteur's Cure of Hydrophobia.

C. R. Drysdale, M.D., Senior Physician, Metropolitan Free Hospital of London, writes as follows to the editor of the *Lancet:*

Having during the past week seen more than 250 inoculations performed in the Rue Vauquelin, and read over a number of the histories of patients operated on by Dr. Roux, I have come to the conclusion that there is no longer any reasonable doubt of the immense advance made in therapeutics by M. Pasteur's process for the cure of hydrophobia. The statistics are so telling that no one, I think, can read them without feeling convinced that an all-important discovery has been made. M. Grancher, whose abilities as a physician all are aware of, takes the date of April 22, 1886, as the one which allows of his drawing a conclusion warranted by the length of incubation of hydrophobia, and then shows that M. Pasteur has treated ninety-six cases of persons who had been bitten by dogs which were proved to be rabid because other animals bitten by them had died rabid, or because rabbits inoculated from their brain and spinal cord had succumbed to the disease. Of these ninety-six cases there was only one death. Again, of 644 cases of bites by dogs which were certified as rabid by the veterinary practitioner of the commune when they were bitten, only three of those treated died. Taking these two groups together, the death-rate of those treated was only 0·75 per cent., against 16 per cent, which is the death rate assigned to a similar set of cases by M. Leblanc, veterinary surgeon of the city of Paris, where patients had been treated by other methods. In addition to these, M. Pasteur has treated forty-eight persons bitten by rabid wolves, and seven of these, or 14 per cent., have died, whereas the death rate of persons bitten by wolves has been shown by M. Brouardel to be 66·5 per cent. Putting these facts together, M. Grancher contends with truth that Pasteur's treatment is twenty-three times as successful against the bites of dogs as the treatments of past times. I may add that the treatment seems to me to be perfectly and absolutely innocuous, and that the only pain felt by the patient consists in the prick given in the abdomen by the injection syringe, ten times on ten consecutive days. The process, too, of inoculating the rabbits is now so simplified that there can be not the slightest reason, except popular prejudice, why M. Pasteur's inoculations should not be performed in every country. All that is required is that an inoculated rabbit should be imported, and then that other rabbits should be inoculated from it at its death. In this way the practice of inoculations might become at one generalized in every civilized country so long as rabies exists, which, of course, it will not do when the muzzling of dogs is as well carried out as it is in Berlin and North Germany. In the mean time, all persons bitten by suspicious dogs should without any delay avail themselves of the noble offer of M. Pasteur to cure them of the most fatal of all diseases.

Paris, June 3, 1886.

P. S.—This morning 102 patients were inoculated by M. Roux at the Rue Vauquelin.

The Dirt in the Wheat Crease.

Concerning this vexatious point, R. J. Abernathey says: "There is dirt that comes from somewhere, that is found after the first break, but I am inclined to think it is what is rubbed off the end of the berry, the hair or fuzz, and loose fine cuticle not rubbed off by the smutter, and possibly comes from that part of the bran covering lying in the crease and not detachable by previous scouring. In fact, I believe that about all so-called crease dirt consists of the cuticle rubbed off and the fuzz rubbed off the end, which it still seems ought to be scoured off by scouring off the whole grain. I have often examined split grains with a magnifying glass, and have never been able to discover any detachable crease dirt, except the possible cuticle referred to. I find a vegetable integumentary growth at the bottom of the crease, thicker than at any other part of the berry, which is sometimes turned back, but it can never be dislocated by splitting the berry nor by subsequent brushing and scalping, it being tough and only removable with the aid of the point of a knife blade; hence that is not crease dirt."

An Optical Illusion.

M. De Parvelle has called the attention of the French Academy of Sciences to a curious illusion of the vision which may account for the apparent oscillation or swinging of stars sometimes observed, and called by the Germans *Sternschwanken*. When the eye looks for some time at a small, feebly lighted body, itself being in complete darkness, the body appears to oscillate or describe certain curves. It is a phenomenon of the subjective order, and appears to be of the same nature as the movement of a star observed when a person leans the head against a wall, and fixes his eye upon the star. The star appears to be agitated in its place and to oscillate rapidly. In order that the motion may be noticed, there should be no moon, and the sky should be clear. A lunette takes away the apparent motion.

DISINFECTING APPARATUS.

Whatever be the theory admitted in regard to the mode of transmission of epidemic or contagious diseases, it is apparent that they do not arise spontaneously within us, but enter from the exterior. Whether the germ peculiar to such or such a disease be demonstrated or not, whether such germ be the cause or the effect of the complaint, it is none the less certain that most transmissible affections are, as Prof. Arnould says, propagated by direct contact of the healthy individual with the sick one, or with some object impregnated with pathologic products, or by an indirect impression upon the healthful economy of the center in which the sick person has lived, or by both methods at once.

Among the means that may be employed to bar the way to such transmission, the best, most assuredly, consists in disinfecting the objects that have been in direct or indirect contact with the sick person. In certain cases, these are the linen that has touched him and the bedding that he has soiled, which may contain the germs of transmission and carry them to a distance. In other cases, the products expelled by him may, after becoming dry, fly off into the surrounding atmosphere and fix themselves upon near-by micro-organisms, which, on being taken into the lungs or mouth, may contaminate other persons. In other words, it is in the matter ejected by a person having a transmissible complaint, and in the fabrics and objects surrounding him, that we find the danger that it is important to provide against.

Is it a question of cholera? The alvine evacuations and the matter vomited up are capable of transmitting the disease with the greatest rapidity. Is it not known that the laundresses who wash linen soiled by cholera patients are almost always the first to catch the disease and have it most severely in any locality?

This disease is transmitted with great facility by water courses when contaminated linen is washed therein, or even when suspected impurities are thrown into them. Among the many modes of transmission, there is an unlooked for one that was observed in Italy in 1884. An individual coming from Toulon, and having the cholera, stopped at an inn upon the way, where he was obliged to vomit upon some straw spread out in front of the door. Shortly afterward, two Italian teamsters, passing by, went into the inn to take a drink. On reaching their own country, they gave the village cobbler their shoes to be repaired, these being all oily and still impregnated in the cracks of the leather with dirt from the road and particularly with impurities derived from the yard of the above mentioned inn. The cobbler, whose hands were excoriated by tools, immediately took the cholera and transmitted it from one locality to another in the village.

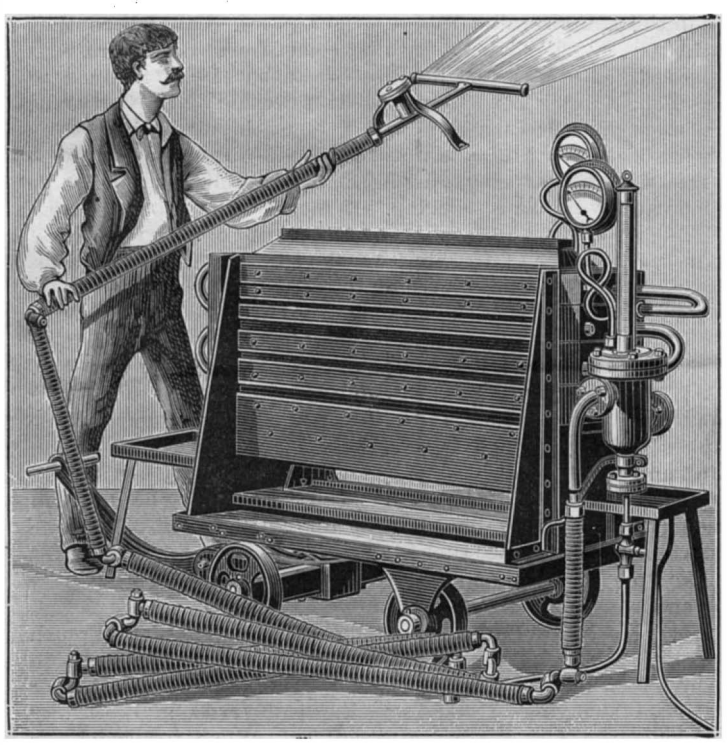


Fig. 2.—STEAM DISINFECTING APPARATUS.

How many examples of the transmission of typhoid and yellow fever, small-pox, diphtheria, measles, and so forth, can we not recall! It must be concluded from this that it is very necessary to destroy the causes of the propagation of these diseases as promptly as possible, and, since most of them depend upon the presence or vitality of this or that micro-organism, it is against the latter that we must fight with most vigor.

Processes capable of destroying the most obstinate microbes, either by the use of varying quantities of chemical agents or of mechanical means, have been sought for a long time. In former times, products from foreign countries were subjected to a lengthy quarantine, in order to expose objects brought by travelers, ships, or cars to a sort of destructive oxidation by the atmosphere; but the exigencies of trade obliged us to seek more expeditious processes, and it was soon found that a high temperature destroyed microbes or prevented their injurious action. Fire doubtless purifies everything, but it is often impossible to use so heroic a remedy; and although General Melikoff in 1879 saved Europe from the pest by burning the houses and clothing of the Wetlianka fishermen, such a *modus operandi* could not be adopted without great inconveniences in a city or in a seaport with the cargo of a ship. It was then that it was found that disinfection by heat could be effected with clothing, bedding, and merchandise in appropriate boxes, whose interior was so arranged that it could be raised to a determinate temperature. Hence the apparatus called "disinfecting stoves," the object of which is to secure an absolute destruction of such pathogenetic micro-organisms as may be contained in the objects that are put into them.

These apparatus were first experimented with in Germany and England. Some are hot-air devices, and others operate through air and steam under pressure. It is unnecessary to say that in such cases we must, in the very first place, take into consideration the necessity of causing the destruction of the microbes, then the rapidity of the operation, and finally the preservation of the fabrics, all of which is equivalent to saying that a disinfecting stove must, in a very short time, possess a temperature which can permeate all fabrics without harming them, and which may yet be sufficiently elevated to destroy every germ. Now, the very numerous researches that have been made on this subject have soon shown that disinfection by moist steam under pressure is much more effective and much more certain than that by dry steam. In Fig. 1 we show a steam stove constructed by Messrs. Geneste and Herscher, which has recently been experimented with, both from a physiological and physical standpoint, by Drs. Grancher and Gariel and some pupils of Mr. Pasteur, and which, upon their report, has been approved by the Consulting Committee on Public Hygiene of France.

According to the words of the report, it suffices to raise the temperature to +106° C. to surely kill, even in the center of a mattress, every pathogenetic microbe. But fabrics cannot be submitted to so high a temperature, nor their fibers be permeated with moist steam with impunity by any process whatever; so great care must be taken to put them only into apparatus in which the disorganization of their fibers and their power of endurance shall be diminished as little as possible. Moist steam apparatus, under slight pressure, in which the operation is rapid, can alone give such results. At all events, these do fabrics less harm than does disinfection by chemical processes.

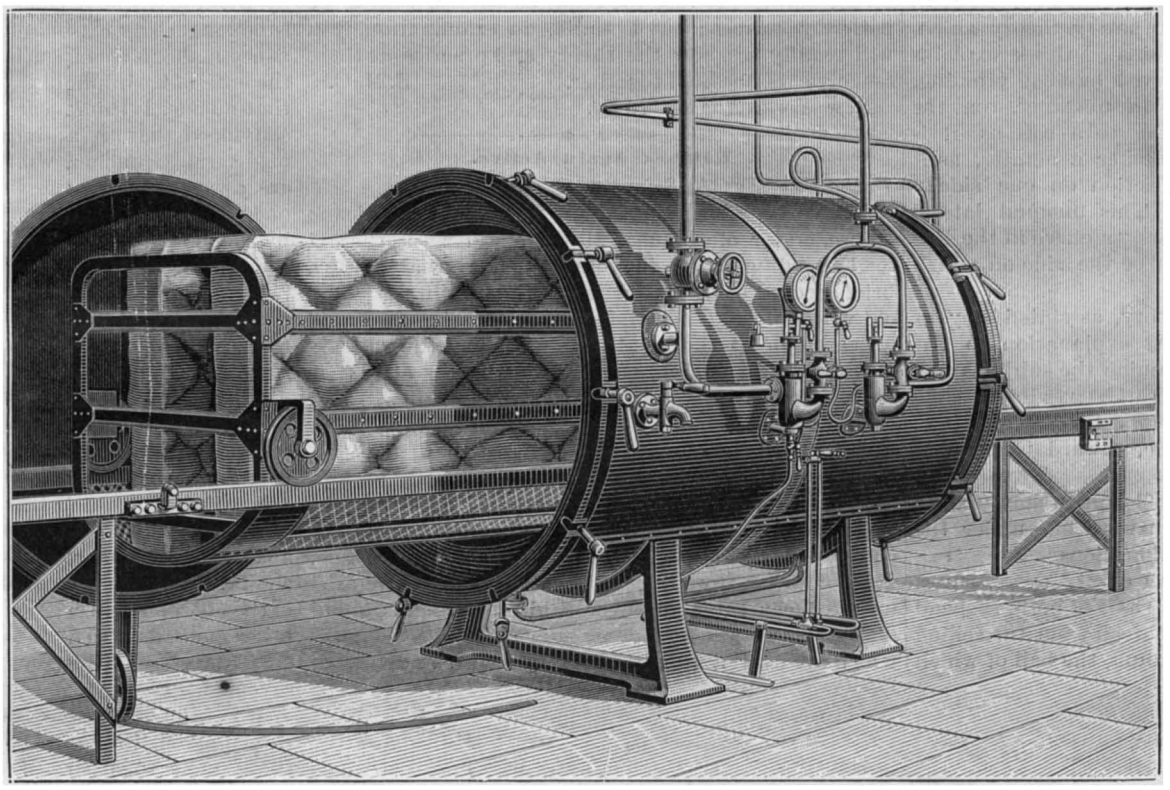


Fig. 1.—DISINFECTING STOVE.

As it stands, Messrs. Geneste and Herscher's stove consists of a large, horizontal metallic cylinder, forming a purifying chamber in which the objects treated are directly exposed to the action of steam under pressure. Although the said pressure should normally correspond to +110° C. (only about half an atmosphere), and be regulated by a safety valve to a maximum of 115° (1½ lb.), the body of the cylinder is constructed of iron plate of a resistance much above such a limit. The cylinder is surrounded by an isolating jacket and provided with entrance and exit doors that are mounted upon pivots and move upon a roller. These are closed by means of bolts, the joint being formed of a circular groove containing an elastic and hermetical packing. The interior of the stove is provided at the right and left with a track upon which runs a carriage designed to receive the objects to be disinfected. In front of and behind the cylindrical body, a double track permits the carriage to put itself into position to be loaded or unloaded—these two operations having to be performed in two separate parts of the disinfecting establishment, in order to prevent disinfected objects from getting mixed with infected ones.

In the interior of the stove there are two sets of heaters, each consisting of a row of iron tubes of small diameter. One of these is at the top, is covered with a screen, and is designed to prevent spotting and wetting through the dropping of water of condensation from the inner surface of the stove. The other, which fills the space below the carriage, is so arranged as to effect a rapid drying of the objects after disinfection.

The objects to be disinfected, having been placed upon the carriage, are introduced into the stove. In fifteen minutes the disinfection will be complete, and it will then only be necessary to partially open one of the doors in order to free the articles from the small amount of dampness that they possess. Moreover, thanks to a depression of 30 or 60 seconds after the first five minutes of direct exposure to the steam, the peculiar state of the steam at the surface of the fibers becomes modified in such a way as to secure a complete drying of even the most tenuous cells, and, consequently of the micro-organisms that have introduced themselves thereinto.

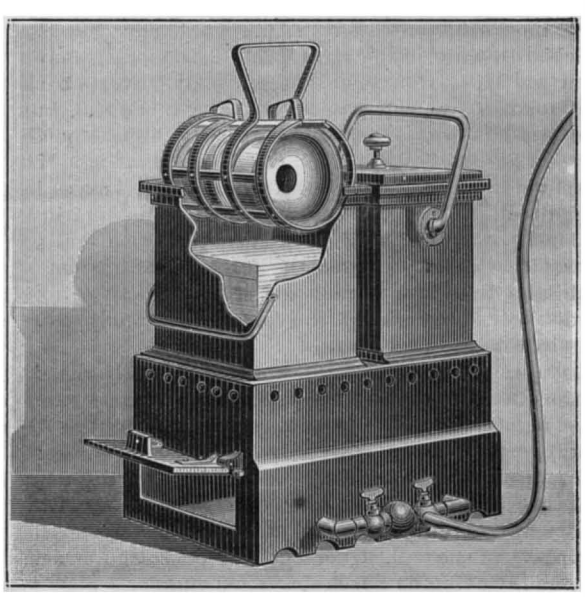


Fig. 3.—STOVE FOR STERILIZING THE SALIVA OF CONSUMPTIVES.

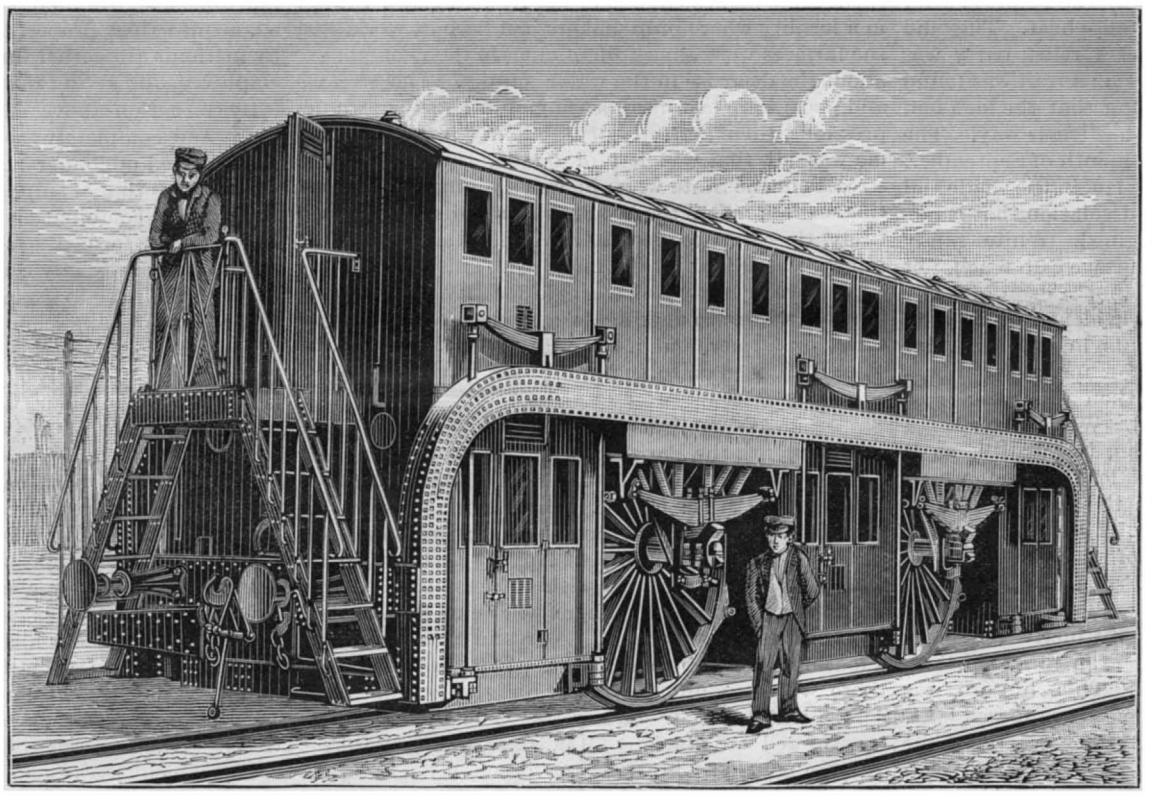
Such an apparatus, stationary or upon wheels, and near a small steam engine, may be used in lazarettoes, hospitals, ships, and so forth, and in public disinfecting stations such as now exist in England to the number of seventeen, and such as it has for a long time been a question of getting up in Paris.

In case of an epidemic, in fact, there would be no establishment of the kind at the disposal of the capital's inhabitants, and, as for the hospital stoves, they are far from offering the proper guarantees that they will operate well, judging from the numerous negative experiments that have been made with them. Now, it is of importance that the disinfecting of soiled and contaminated articles shall not be left at the disposal of the public, for the operation is a nice one and requires apparatus that has been constructed with both a technical and scientific understanding of the question. In 1884, Mr. Siegfried, then Mayor of Havre, prompted by the example of England, decided that every time a case of cholera should be reported to the authorities, two cast iron closed vessels should be carried to the dwelling of the patient, and that in the smaller of these the evacuations should be deposited, and in the larger the soiled linen should be placed. Twice a day these vessels were carried by a wagon to a disinfecting station, and two empty vessels were left in their stead. This was a very wise measure, and one that should be adopted at all times and for all contagious diseases.

Messrs. Geneste and Herscher's disinfecting stoves are now in use in the Hyera Islands, at Port Cros and Bagau, as well as at Sidi Ferruch, in Algeria, where they are permitting the baggage and clothing of the troops coming from Tonkin to be very quickly purged; moreover, the state transports are soon to be provided with them, in order that disinfection may be effected on board during the trip. Profs. Brouardel and Proust have rightly got the government to adopt arrangements by the terms of which every large ship on which, under the guarantee of a duly commissioned physician on board, precautions of this nature have been taken, shall be admitted to practice after a simple inspection, and when no case of suspicious sickness has been found. Besides, such disinfecting arrangements would allow of passengers being detained in lazarettoes but a few hours only, without danger.

It is often of importance to destroy the micro-organisms which may have settled upon the walls of a house or the sides of a car, ship, stable, and so forth, and which would render a long stay in such structures dangerous. The vapors of certain chemical compounds are here again usually inefficacious, and cause unsightly defacements that are costly to remove. It would be necessary to have a means of placing the walls of rooms and the furniture that the latter contain under the same conditions as the objects purged in a steam stove. But steam, by condensing, soon loses its temperature at the extremity of a conduit unless it can be superheated on its passage from the boiler to the nozzle, and this has led Dr. Redard to devise a method by which this can be done on cars; and Messrs. Geneste and Herscher, taking up the subject, have invented an apparatus for the more general application of the Doctor's process. Let us suppose a movable engine or a boiler placed in the yard of the house, or near the car or other object to be disinfected. A pipe leads the steam from the boiler into a peculiar superheater (Fig. 2) consisting of several transportable parts, from whence it enters a series of conduits analogous to those used by street sprinklers. A perforated tube placed at right angles with the extremity of the conduit allows the operator to project steam of 110° C., with the greatest ease, all along the surface to be disinfected.

Finally, Messrs. Geneste and Herscher's disinfecting apparatus are completed by a stove for sterilizing the spittle of consumptives. This (Fig. 3) consists of two rectangular copper boxes placed upon a brazier or a gas or charcoal stove, according to circumstances. One of these contains a saline solution whose boiling point may be higher than the temperature necessary to destroy the tuberculous bacillus, while the other contains an appropriate lixivium designed for disintegrating the glutinous envelope of the spittle and for washing spittoons. These latter are placed in a metallic cage which is passed into the boxes alternately. After an ebullition of a few minutes, the disinfection and cleansing are complete.—*La Nature.*



ESTRADE'S PASSENGER CAR.

ESTRADE'S RAILWAY CARS.

In our issue of July 17 we gave a description and illustration of Mr. Estrade's high speed locomotive, the distinguishing features of which are wheels of large diameter with coupled axles and a new style of double suspension.

Mr. Estrade's cars (see accompanying engraving from *La Nature*) are mounted in the same way.

The adoption of wheels of so large a diameter has led to the necessity of giving these cars quite a peculiar form, and one very different from that of the ordinary type.

As it was necessary to raise the flooring above the axles, an endeavor has been made to utilize the space left free between the latter by the adoption of a two-story car. The upper of these stories is on a level with the top of the wheels, which are inside of the frame. In the lower portion we thus have three distinct compartments, isolated by the wheels and prolonged toward the axles by narrow passages that may be used for water closets or for the storage of luggage, and, in the upper portion, a single saloon with central passage, to which access is had by stairways at the ends of the car. In certain respects, this general arrangement recalls that of the Vidard type, with central passageway, which is met with on a few lines in the suburbs.

All the vehicles of the same train will be connected at the level of the central passage by coupled platforms provided with hand rails, so that access may be had to all parts of the train, as in American railway practice. The car thus arranged, with its two stories, contains 54 first-class seats in a total length of 43½ feet between buffers.

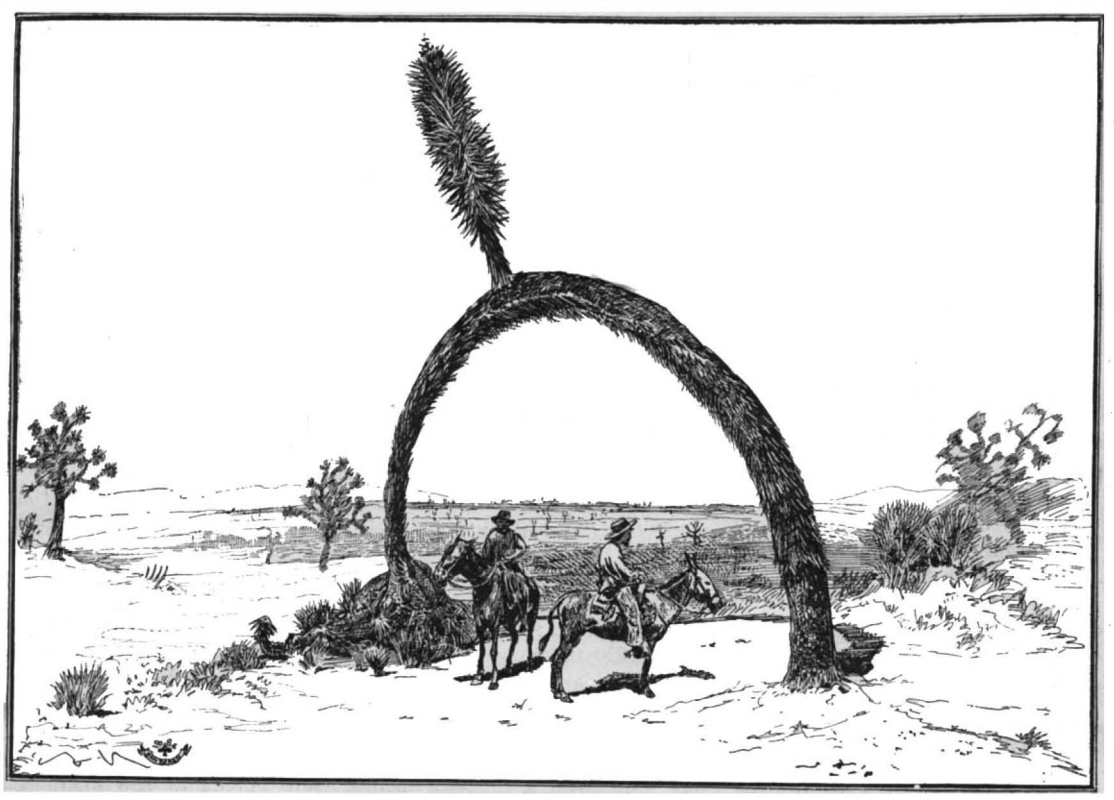
The double mode of suspension of the body forms one of the most interesting peculiarities of the car. The two axles, which are 16 feet apart, support, through the intermedium of elliptic springs resting upon the grease boxes, a large iron girder, which runs the entire length of the car, and is curved toward the ground at the extremities.

Each of these girders carries three elliptic springs, which support the body of the car through suspension rods connected with a lower frame.

The increase in the size of the wheels, which are 8¼ feet in diameter, will undoubtedly have the effect of reducing the tractive stress; but, with Mr. Roy, who made a judicious observation on this subject in a discussion of the Society of Civil Engineers, we may ask whether such reduction will be very perceptible. It will likely not exceed 1½ kilogramme per ton hauled, that is to say, it will reach nearly a tenth of the mean stress that the locomotive ought to develop during a normal run over an ordinary line, taking into consideration the resistance of the air, of curves, of gradients, and, in a word, of all resistances that are independent of the diameter of the wheels. However this may be, the experiment is, in every respect, of the most remarkable character, and we shall watch it with the greatest interest.

Diseased Eggs.

Dr. D. F. Wright, in the *Bulletin of the Tennessee State Board of Health*, says that soon after it became the practice to transport eggs in large quantities and to long distances by railway trains, it was found on their arrival that adhesion had taken place between the membranes of the yolk and those of the shell, so that the yolk could not be turned out of the shell unbroken. On examination by experienced pathologists, this was found to be the result of true inflammation; the material of the adhesion was found to be precisely the same as that of the plastic exudation in inflammation of the lungs or bowels. It will at first seem absurd to speak of inflammation in such an unformed mass as an egg; but this arises from our forgetting that, structureless and unorganized as it seems, the egg, even when fresh laid, is a living being, and capable of disease from external causes. The cause of this inflammation is undoubtedly the shaking and friction from the motion of the cars, and it cannot but render the egg more or less unhealthy, as the products of inflammation can never be as salutary in food as those of healthy growth.



REMARKABLE YUCCA TREE.

THE VALUE OF A DESERT TREE.

In approaching the to be State of Southern California from the east, a region is passed that seems arranged by contrast to intensify the beauties beyond. This tract is best known as the Mojave desert, and an equally sterile region lies to the southeast in Arizona.

Before the days of the railroad, these places had to be crossed by horses and wagons; and as in some localities a temperature of 130° has been recorded, that to pass it is a test of human endurance may well be

imagined. A horse dealer, who rode over this desert in June, informed me that even then he had the greatest difficulty in making the trip, and that the heat was so intense and terrible that the mind was often affected by it. I asked him if he expected to return this summer, and his reply was that no amount of money would induce him to take the trip so late in the season, and that he had reason to believe that two trains containing families that had started after him had fallen victims to the intense heat. They did not arrive when they should, and a relief party was sent back, but could not find them; a trail was found winding round and round, showing that the men had evidently become confused and lost their way. The writer crossed this desert in the month of September, when the thermometer indicated 110° in the shade and in a current of air. The scene of desolation that is pictured here can hardly be imagined. White sandy wastes stretch away as far as the eye can reach, not a living thing being visible, and not a drop of water or even a rain cloud. The only evidence of its presence is seen in the great washouts in the sand, dry beds of mighty streams that flow for a few hours while the rain continues, and then disappear mysteriously in the treacherous sand. While water is not to be found in this desert region, its wraith, as it might be called, is often seen leading the weary traveler for long distances from the trail, to find it a mirage, a delusion, and a snare. I was particularly impressed with the perfection of this deception in crossing the great Utah desert. Frequently large lakes would appear ahead, apparently about six or eight miles away. The water was as distinctly visible as any that I have ever seen, and even the reflections upon it appeared to be visible. This illusion was kept up until within half a mile of the supposed lake, when it would slowly fade away or take the shape of a glaring sandbank.

On the Utah desert the landscape is relieved by wonderful scenery, the general outline of the country resembling that of the Bad Lands—castles, fortresses, towers, wonderful spires, and even walled cities, being pictured in the rocks on all sides; but in the Arizona and Mojave deserts, the country is, as a rule, level. Curiously enough, the inventive genius of man has discovered a use for some sections of this country. Approaching the borders of the desert, signs of vegetation are seen, and especially, on the Arizona section, the enormous candle cactus, described in a previous number of the SCIENTIFIC AMERICAN. On the Mojave tract, the cactus seems to give place to groves of the yucca—strange, weird growths, the veritable reptiles of the vegetable world in the remarkable shapes they assume. Nature seems to have exhausted all her ingenuity in devising new forms and positions for the trees growing in the sand, as dry as the utter absence of moisture can make it. They rise from ten to thirty feet in a single stalk, and then branch out in club-like limbs, attaining every possible shape. Some appear like strange insects of gigantic stature, sprawling over the plain; others resemble candelabra, the thick, branching spires representing the charred wick; others again look like weird hands extending from the ground, as if grasping or groping after the unattainable.

One of the most remarkable positions is shown in the accompanying cut, which shows a yucca of extreme size; the top of which, too heavy for the trunk, has bent over, descended, and attached itself to the earth again, forming a complete arch, under which four or five horses could pass abreast, and twelve or fifteen feet at the highest point. From near the top of this singular arch springs a single limb, presenting the appearance of a tree of a totally different kind growing from the bent and curved trunk. Our engraving is taken from a photograph of the tree.

To the ordinary observer, these grotesque creations would seem to have little value beyond attracting attention from the barren, sandy waste, and perhaps relieving the monotony; and few tourists could be prevailed upon in crossing the desert to accept as a gift one or a thousand acres. In point of fact, most of this yucca land has been bought up, and is controlled by two or three companies, mostly English. Their organizers discovered that the trees afforded a valuable pulp that could be made into paper, so to-day every yucca tree has a certain value, and, curiously enough, the London *Telegraph* is printed on paper made from these trees of the American desert. The *Telegraph* company has been among the foremost in Europe in investigating the pulp question, and it is understood that the yucca is the most satisfactory material yet obtained, either in North or South America.

In the late Southern California Fair specimens of the pulp were exhibited at Los Angeles, showing the wood in various raw states. The paper is manufactured in England, the fiber being merely crushed in this country, and packed for shipment in bales; the ensuing conversion into paper being a too well known process to dwell upon. The supply of yucca, as far as appearances go, seems practically inexhaustible; but when it is remembered what a vast amount of paper a daily or weekly newspaper of good circulation uses, it is evident that, after a while, the slow-growing yucca will become exhausted; but, as pulp hunters are continually in the field in every country, some new material will probably be found to take its place.

That the discovery that pulp will make good paper is undoubtedly of value, no one will deny; but when the question of despoiled forests is brought up and fully appreciated, it will perhaps be found that we are robbing Peter to pay Paul. Two or three years ago I spent some months in one of the New England States, in a locality where pulp makers had been at work, and the farmers were almost unanimous in their complaints about the decrease in the water supply. The streams and pools were fast disappearing, and I was shown depressions, then perfectly dry, that my informant told me was all that was left of one of the finest trout streams in the State when he was a young man; and in this section, where the brooks had not disappeared entirely, they were reduced so in volume that their usefulness was almost totally impaired. This is merely the experience or history of a single locality, but it serves to show that pulp making is a menace to the agriculturist or farmer, and if the rag supply should fail, he would be called on to decide between trees and books.

Cremations at Pere la Chaise.

Next month the Parisians will be able to burn their dead in four crematory furnaces, which have just been finished at Pere la Chaise. These furnaces were begun last November, and have been hurried on to completion, so that by the end of August at latest, those who, in dying, express the wish to be cremated can be there reduced to ashes. There will be no first, second, and third class cremations. Poor and rich will be on a footing of absolute equality. The price charged to those who can afford to pay for the burning of a corpse will be 15 f.—or say 12s. The furnaces were constructed on plans by MM. Barrett and Formice. A large portico is in front of a dome, beneath which are placed the crematory furnaces. They have the appearance of very elegant ovens. Three hundred and fifty thousand francs was the price they cost. They are according to the Corini system, in use in Rome and Milan. It was found that the heat of the Siemens furnace was too intense. Instead of reducing the corpse to ashes, it subjected it to a kind of vitrification. The cost, too, would be 200f., instead of 15f., to cremate with a Siemens furnace. The unclaimed bodies at the hospitals which are not used for anatomical purposes will be taken to the crematory at Pere la Chaise. Sculptors, goldsmiths, and bronze casters are already busy designing urns, of which an assortment in marble, bronze, gold, silver, zinc, or lead will be kept at an office of the crematory. The relatives of the cremated dead can buy these vessels, and cause them to be removed to family vaults or to a building which the city of Paris is to erect. There could be no greater boon to a large city with overcrowded cemeteries than the furnaces of Pere la Chaise. I cannot conceive anything more disrespectful to the dead than the way their remains are treated here, even when a first-class burial can be provided, if there is not a family vault in which to place them. Buying a grave is no simple matter. The delays are endless, and the application for one must go through many bureaus before official consent is given. Then there are other formalities to be gone through. Meanwhile the corpse is in a charnel house, called a provisional vault, at a cost of 1f. a day. The removal thence to the grave, which must be in masonry at the sides, is a cause of danger to the public health.—*London Daily News.*

A New Process for Soap.

At a recent meeting of the National Agricultural Society of France, under the presidency of the distinguished father of tinctorial chemistry, M. Chevreul, the question of the utilization of suint, the natural grease found in wool, was discussed. The subject is not a new one. Half a century ago, M. Chevreul had made known the elementary composition of suint, but from that day to this, little or no use has been found for it. Flowing from wool scouring machines into natural watercourses, it pollutes them and renders the lands through which they run insalubrious. The evil is a growing one. Since his first researches, the consumption of woolens in France has doubled. Her annual clip has grown to 220 millions of pounds, and she imports at least an equal amount. Of these 440 million pounds, nearly 50 per cent is waste, of which the principal part is suint.

To utilize this enormous quantity to the profit of the soap industry has long been a favorite project, but the difficulties in the way have been too great, because the suint, in the condition in which it is extracted, has been found to be non-saponifiable.

To adapt it to the purposes of the soap boiler, and thus make it available in the manufacture of the 600 million pounds of soap annually produced in France, would at once rid the textile industries of a great and growing nuisance and cheapen the cost of one of their indispensable necessities. M. Rohart exhibited before the society above named a quantity of soap made by him on a large scale, from suint, at the works of Michaux Brothers, at Aubervilliers. He first changes the elementary composition of the suint, by the use of sulphur. This he does by simply raising the grease to its fusing point, and bringing it in contact with sulphureted hydrogen. The gas is absorbed in large quantities, as high as 100 times the bulk of the grease being taken up. At the close of the operation the sulphur has become a constituent of the fluid mass, which, like almost all other fatty matters, when simply treated, acquires new properties, permitting it to be treated by methods altogether different from those previously employed, and giving rise to products also new.

By the action above stated, suint becomes immediately and completely saponifiable in the cold. The soap formed no longer possesses the odor peculiar to suint, nor is that of sulphureted hydrogen perceptible. An intimate combination of the constituent principles of the matter formed has therefore taken place. This is further indicated by the fact that if the mixture be run into the pans to grain at 30° to 40° C., its temperature will rise in a few hours to 60° or 70° C.

In practice, the result is of uniform quality, fine grained, and perfectly homogeneous. The operation is finished in an hour, while usually the making of a batch of soda soap takes six or eight days. The claim is made that if strong, upright machine mixers be used, 100,000 pounds of soap can be made in a day, without much expense either for labor or fuel. In view of its many applications, this is a very cheap soap.

The great interest naturally felt in this discovery is enhanced by the new chemical reaction which it has revealed; a reaction as unexpected as it is valuable. Contrary to what has hitherto been known concerning the saponification of fatty matters, this can be produced completely without first rendering the alkali caustic. Alkaline carbonates serve the purpose perfectly. This new scientific fact is not only applicable to fats which have previously been converted into fatty acids, but is true of all such matters, including suint, which are not normally saponifiable, even with caustic alkalies; for in the presence of fatty bodies previously sulphurized, alkaline carbonates are immediately decomposed, even in the cold. Carbonic acid gas is so abundantly disengaged that unless the vessel be deep, a portion of its contents will froth over. If this be avoided, the result will be a soap perfectly defined.

The change undergone by the suint would seem to be due to substitution, a molecular movement which reveals the power of the affinity of the alkalies, or rather perhaps of the alkaline metals, for sulphur. This fact must be recognized in accounting for the expulsion of carbonic acid from its combinations with potassa and soda. That, under the circumstances, this gas should be expelled, is not only a surprise to the scientist, but a great boon to industry. If, in the state of the caustic alkali, a certain quantity of soda cost 46 cents, that quantity in the form of carbonate would cost 29 cents, a difference of 17 in 46, say 38·5 per cent. Where, as in Marseilles, many millions of pounds of soda are annually used in the soap manufacture, the importance of this saving is manifest. Moreover, as the result is the same with the carbonate of potassa as with the carbonate of soda, it is doubtless possible to apply the process directly to the manufacture of softsoaps, using for the purpose the crude "pots and pearls" of commerce.—*Textile Record.*

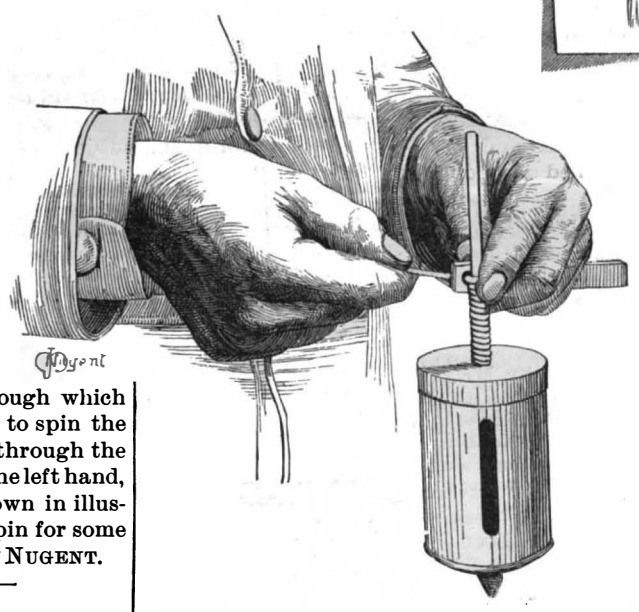
The Treatment of Rabies with Hoang-nan.

According to the *Gazette Medicale de Nantes*, twenty four cases of rabies have been treated with hoang-nan by Dr. Barthelemy and several other medical men of that city or of the department. The first case so treated was in the month of March, 1882, the last in April, 1885. Ten times, at least, the bites, which were most frequently multiple, were situated ou the hands, once on the hand and on the face. In the majority of cases cauterization was completely omitted, or practiced several hours or even several days after, with agents little active, such as liquid ammonia or a solution of carbolic acid. Two of the patients, who were closely observed by Dr. Barthelemy—viz., a man of thirty and a lad of sixteen—presented symptoms of rabic mania: persistent insomnia, anxiety, nocturnal agitation, the desire to run, hallucinations, barking, etc. However, none of these persons felt hydrophobia, nor have any of them, to this date, succumbed. The duration of this preventive treatment was, on an average, twelve days. The total dose of the powder of hoaug-nan ingested during this time varied in adults from six to eight grammes. It was scarcely necessary to go beyond one gramme per day to obtain the physiological effects of the medicine—exaggeration of the reflexes, cramps, rigidity, slight trismus. The maximum dose was arrived at progressively, and in some cases the treatment was terminated by gradually decreasing doses. From the above cases the author deduces either that rabies is communicated much more rarely to the human species than is generally admitted, or that the hoang-nan, administered progressively to the physiological effects *during the period of incubation*, sufficiently and efficaciously modifies the nervous system and the entire economy to prevent the evolution of the rabic virus.

A HOME-MADE HUMMING TOP.

On one of my visits to a small town in France, I chanced to see a lot of boys making a kind of top with a small piece of wood and an old baking powder box. It was one of the most simple tops that I ever heard of, and made a loud noise. By taking any tin box, such as a baking powder box, any boy can make one. First, fasten the lid on securely with glue or white lead, and then punch a small hole, about three-eighths of an inch diameter, through the cover, and also through the bottom of box. Be careful to make the hole right in the center, or the top will lean on one side, and will not spin as long as it would if the hole is in the center. Put a thin stick through the holes of box, so as to fit it tightly. The stick should be sharpened at one end, to serve as a peg for the top, and should be thicker at that end and gradually get thinner as it leaves the peg. Insert the thin end of the stick into the hole on under side of box, and pull it through the top hole until it can be pulled no farther. Of course the lower end of the stick must be broader than the opening in the under side of the box, so as to prevent the box from slipping down.

Cut a slit in the side of the box, as is shown in illustration. This opening will make the top hum when in motion. Procure a small piece of wood about 5 or 6 inches in lengh, three-quarters of an inch in width, bore a hole through one end, through which a string can be easily passed. This you use to spin the top. Wind up the top, pass the string through the hole in the stick, which should be held in the left hand, and pull the string with your right, as shown in illustration. If rightly made, this top will spin for some time, and will sing well. J. M. NUGENT.



A HOME-MADE HUMMING TOP.

BOILER DRILLING MACHINE.

The boiler drilling machine which we illustrate was recently constructed for the Clyde Locomotive Works, and is adapted for drilling the holes for the rivets after the plates are bent and fixed in position; it is arranged to admit shells up to 5 ft. in diameter, and made of plates up to 6 ft. wide.

The shell is mounted on a circular table, placed between two uprights carrying horizontal drilling saddles. This table is fitted with jaws forming a concentric chuck (gripping at six points), so that a ring can be quickly and accurately mounted ready for drilling.

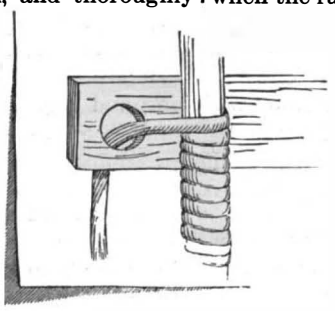
It is also provided with a worm and wheel controlled by Scott's dividing apparatus, by which the circular seams can be divided into any desired number of holes without setting out the plates. The table is also arranged with power driving gear controlled by a foot lever, so that when setting the rings or adjusting the work to the drills the table can be revolved at a rapid pace. The uprights, having the vertical slides with drilling saddles, are adjustable along the beds for the different diameter of shells, but are rigidly bolted to the beds when drilling. One of the uprights carries a saddle with two spindles, whose centers are adjustable to the different pitches of rivets, and are for use in the longitudinal seams of the shell. The drilling saddles are fitted with Dixon's releasing motion, by which the drills are instantaneously brought back together, ready for the next hole, without stopping or reversing the machine.

When drilling the longitudinal seam of the shell, the drilling saddles are elevated together by independent power driving gear, a pitching staff and pointer being provided for determining the position of the holes in this seam.

Kendall & Gent are the makers, Springfield Works, Manchester.—*Engineering.*

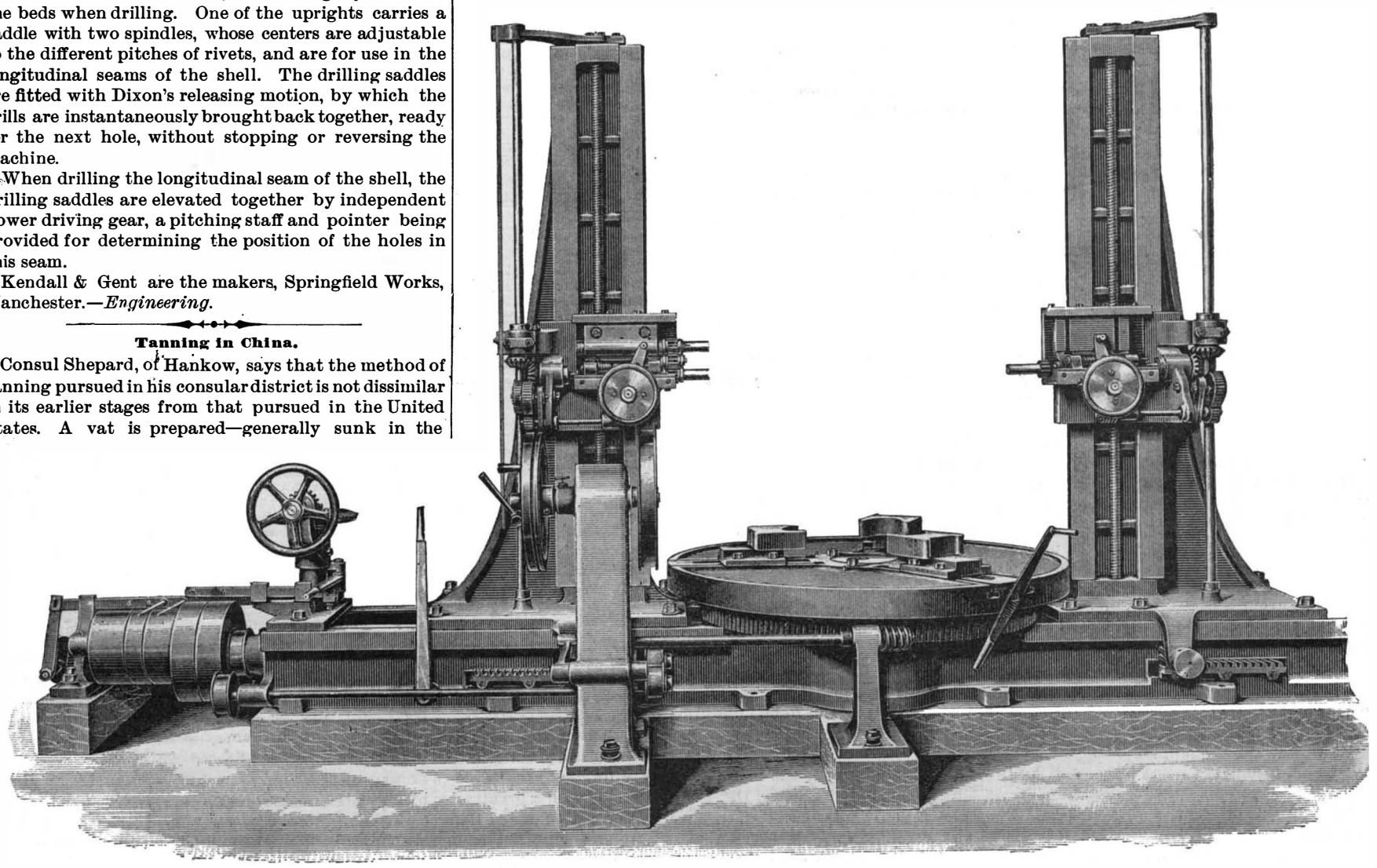
Tanning in China.

Consul Shepard, of Hankow, says that the method of tanning pursued in his consular district is not dissimilar in its earlier stages from that pursued in the United States. A vat is prepared—generally sunk in the ground—capable of holding about thirty hides. These are covered and left to soak in a solution of lime, called by the natives "milk of lime." They are kept in this bath sixteen days and upward, according to the season, cold weather requiring more lime than warm. The hair is then loosened, and the hides are taken singly, spread upon a bench, and thoroughly put through a scraping process to remove the hair and offal from the flesh. The tool used for this purpose is of peculiar construction. It is shaped like the capital letter H, one side being a steel or iron blade, and the other the handle, the cross bar merely connecting them. The blade is about a foot in length, and the handle two or three inches less. The workman places the handle against his breast for greater ease and power, and with this forcible application of the tool to the hide the hair is speedily removed. The hide is then turned with the flesh side up, and by a similar manipulation all offal is removed, and the hide is reduced to a uniform thickness. A thorough washing follows, and the skin is cleansed of all remains of the lime. The refuse hair is saved for agricultural purposes, and the scrapings of the flesh side are boiled down for glue. After the cleansing the hides are subjected to a vigorous rubbing with a heavy sandstone, or similar article, until both sides are thoroughly smooth. When this process is completed, a strong decoction of nutgall is sprinkled over the green leather, and then the tanning is commenced. The nutgalls are boiled in water over a slow fire until they become liquefied, and the strained liquor furnishes all the tannin used. Nutgalls are abundant in the districts furnishing exports to Hankow, and considerable quantities are sent to the United States. The next process to which the skins are subjected is as follows: A kind of furnace is built underground with an opening in circular form, from which a dense smoke issues when the fuel is fired. The fuel required is either wheat straw or a species of grass gathered from the mountain side; it is believed that nothing else will answer the required purpose. For the space of seven days the hides are passed backward and forward through the smoke issuing from the furnace, and, unless it is to be blacked, the tanning of the leather is thus completed. If it is to be blacked, a liquor of vinegar in which iron has been left to corrode, or a solution of nutgalls and copperas, is ordinarily used, but at times simple lampblack is employed. The yellow-brown color given to the leather by the smoking process is considered to be of remarkable beauty, and is therefore greatly preferred by manufacturers and wearers. The leather is made soft by sprinkling it with saltpeter during the smoking, accompanied by repeated and violent kneading of it, drying it in the air, instead of by exposure to the sun. The strength of the solution of saltpeter as applied is said to be kept secret, no apprentice being initiated to the knowledge of it until he has served for three years.



New British War Ships.

On August 3, thousands of people assembled on both banks of the Tyne to witness the launching of H.M.S. Orlando from the Palmer Shipbuilding Company's yard. The Orlando is the first of the belted cruiser class, of which seven in all are now building. They are quite a new departure in war ship design, and are superior to anything of this class of war vessel afloat in point of speed, are much more heavily armed, and have greatly more defensive power than the Mersey class, which approach them nearest from a constructive point of view, the chief difference consisting of a belt of armor at the water line, which is fitted in the Orlando class, and from which they derive the name of belted cruisers. The engines and boilers occupy four separate compartments, arranged in a fore and aft line along the middle of the vessel, fitted on each side by coal bunkers about 5 ft. in width. The armament is exceedingly powerful, and consists of two 9·2 in. 22 ton guns, ten 6 in. 5 ton guns, six 6 pounder and ten 3 pounder Hotchkiss quick-firing guns, and numerous boat and field guns. The engines, which have been designed by the builders, embody all the latest improvements in engineering, and are of the triple-expansion type, the cylinders having a stroke of 42 in. There are two sets of engines, the Orlando being a twin-screw vessel. They will develop 9,000 indicated horse power when working under forced draught, and it is expected that the vessel will attain a speed of about 19 knots.



IMPROVED BOILER DRILLING MACHINE.

ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. John H. B. McCray, of Kellerville, Ill. This invention consists of a drawbar with curved face coupling hook, connected by a chain with a lever pivotally mounted in a slot formed in the end timber, with other novel features, whereby cars may be coupled without danger of accident to the train men.

A pressure regulator has been patented by Mr. George W. Lawton, of New York city. It has a main piston cylinder and a valve chamber connected, the latter being connected by a pipe to a reservoir, boiler, or conduit, in which pressure of water, air, steam, or gas is maintained; and the construction is such that when the pressure rises above the required point it will operate the valve in the valve chamber.

The operating of mine doors forms the subject of a patent issued to Mr. Peter F. Snyder, of McKeesport, Pa. A rock shaft is arranged alongside the track, and pivoted to it is a guard or push bar, rotated by contact of the cars as they pass along, the mine door being connected with the shaft by a peculiar mechanism, which raises the latch and swings the door open when the shaft turns in consequence of the lateral pressure of the cars.

A compound water gauge for steam boilers has been patented by Mr. David Pyke, of Philadelphia, Pa. It consists of three parallel glass tubes, with elbow couplings at their ends, having offsets in their inner arms, with valves and cocks and a three-way globe valve connected with the ends of the center tube and with the elbow couplings, with other details, to surely indicate the state of the water should one or more of the connections become clogged.

AGRICULTURAL INVENTIONS.

A feed trough for poultry has been patened by Mr. Milo D. Beach, of Litchfield, Conn. It has a series of upward projecting spaced wires, curved inward toward each other at their upper ends, the trough holding feed and water, but so arranged that the fowls cannot light on the top of the trough.

A band cutter and feeder for thrashing machines has been patented by Mr. Jacob W. Turner, of Middle Point, Ohio. It is so constructed that the rake frames shall receive a lateral and an up and down movement at the same time, with other novel features, the invention being an improvement on a former patented invention of the same inventor, to make such machines more convenient and reliable.

A harrow has been patented by Mr. Joseph Hildesheim, of Alton, Iowa. Such arrangement of the draught chains is provided as will make the harrow either vibrating or non-vibrating, as desired; and the construction is such that the harrows will readily adjust themselves to the surface of uneven ground, while they can be readily adjusted to serve as pulverizing or as smoothing harrows.

A combination plow has been patented by Mr. August A. Weinmann, of Ennis, Texas. The frame is of iron, in which are two plows that form a ridge, and a shovel makes a furrow, shallow or deep, as desired, in which seed are dropped through a seed spout, after which the seed are covered by shovels and the earth pressed down by a roller, the plow being one which can be used as a corn, cotton, or sugar cane planter, and also as a cleaner and chopper.

MISCELLANEOUS INVENTIONS.

A folding table has been patented by Mr. Alonzo B. Jones, of Jeffersonville, Ind. It is more especially designed for use as a lady's work table, and the invention covers a novel construction, wherein the legs are arranged to be folded beneath the top of the table.

A combined latch and lock has been patented by Mr. Edwin R. Ferry, of New Haven, Conn. It consists of a suitable case, a tumbler, a bolt with a horizontal slot and spindle, in combination with a lever and locking device, and is so constructed and arranged as to be operated from either side of the door.

A spring and nose piece for eyeglasses has been patented by Mr. George W. Hassellund, of Newcastle, N. Y. The eyeglass frame has a clamp for holding a round wire spring and round wire nose pieces, and combined therewith is a spring with nose pieces inclosed in a cylindrical covering of cork.

A combined baby jumper, rocking chair, and crib has been patented by Mr. Owen S. M. Cone, of St. Paul, Minn. The invention covers novel features of construction and combination of parts for the making of a simple, inexpensive, and substantial article of furniture, readily adaptable for all these uses.

A clothes drying apparatus has been patented by Mr. James W. Miller, of Central City, Neb. This invention covers a clothes pin suspended from the line, and the clothes held by it, but not clamped on the line, so that articles may be suspended and moved freely along the line without actually coming in contact with it.

A musical top has been patented by Mr. Robert Richardson, of Detroit, Mich. The top is so constructed that its rotary motion will move perforated music paper across the apertures of one or more reed organs, similar to the ordinary mouth organs, the rotary motion of the top gathering sufficient air to operate the reeds of the organs.

A brick machine has been patented by Mr. William E. Tallcot, of Croton Landing, N. Y. This invention covers an improvement on brick machines formerly patented by the same inventor, and covers modifications in construction and combination of parts intended to make the machines more convenient in use and more reliable in operation.

A musical box has been patented by Mr. Paul Lochmann, of Gohlis, near Leipsic, Germany. It has a plate with pegs or pins and a two-part comb, the pins or pegs so arranged that those of half of the plate engage with the corresponding part of the comb, and those of the other half avoid such part and engage with the other part of the comb.

A daubing brush has been patented by Mr. David G. Lawrence, of New York city. It is of that kind in which the bristle block is pivoted to revolve when in use, to avoid uneven wear, and is so made that there will be no strain on the bolt which extends down through the center of the brush block, and on which the brush revolves.

A grain weighing and registering apparatus has been patented by Mr. Joseph S. Marshall, of Clearwater, Kan. The invention consists of a measuring wheel, into which the grain is discharged by an elevator from the thrashing machine, there being a device for weighing the grain within the wheel and a device for registering the grain weighed.

An alphabetical toy has been patented by Mr. William F. Hopkins, of Sturgis, Dakota Ter. It is a device in which, by the reciprocation of a cover plate on the turning of a crank, different letters will be made to appear in succession, and thus give them an interest calculated to enable a child to rapidly learn letters and numerals.

A brick kiln has been patented by Mr. George M. Harris, of Pawnee City, Neb. It is heated by hot air admitted to the kiln from a furnace by ducts or eyes, the admission of both hot and cold air being controlled and regulated by adjustable dampers, which are so arranged that they can be controlled by means of chains from the outside.

A capstan has been patented by Mr. Samuel Montgomery, of West Toledo, Ohio. This invention covers novel features and combinations of parts for an inexpensive, durable, and effective machine for operating a draught chain for hauling a ditching machine or heavy timber, or pulling stumps in clearing land, or for similar uses.

A pantaloons protector has been patented by Mr. James D. Hanan, of Brooklyn, N. Y. It is made of a wire bent to form a tongue to go inside the shoe over the back, and having a bend which also goes down and upon the outside in such way as to afford a support for the bottom of the trousers legs, keeping them from the ground when the walking is bad.

A telephone transmitter has been patented by Mr. Herman Ehrlich, of Jersey City, N. J. It has novel features of construction, such as to admit of a very delicate adjustment of the carbon in position relatively to the contact points, and so that this adjustment may be easily maintained, and there is little danger of the parts getting out of order.

A self-inking hand stamp has been patented by Mr. Louis K. Scotford, of Kansas City, Mo. Combined with a reversible plate carrying dies or type is an additional plate held on the first by adjusting screws to regulate the distance between the two plates, whereby the type or die plate may project a greater or less distance from the reversible frame on which it is held.

A frying pan and baker has been patented by Messrs. Harry C. Crawford and Edwin V. Mundy, of Duluth, Minn. It is a folding baker with a hinged cover and triangular end pieces having pivoted clips, one of which will hold the end pieces folded against the cover when articles are to be baked, and providing a simple and effective portable device for baking, roasting, and frying food.

A thill coupling has been patented by Mr. Frank P. Johnson, of Eyer's Grove, Pa. It consists of a clip having in one arm a T-shaped slot and set screw with polygonal boss, and the fork for receiving the thill iron has a T-shaped head fitted to the slot of the clip, and adapted to be held by the set screw, there being also a spring of peculiar form to prevent rattling of the thills.

A gearing for windmills has been patented by Mr. Henry G. Newell, of Orwell, Pa. It is designed to transmit the full power of the windmill to the work shaft, besides keeping the wheel always in the direction of the wind, the invention consisting of trains of gear wheels connected with the wind wheel shaft and operating two shafts which impart motion to the transmitting shafts.

A vegetable cutter has been patented by Mr. Stephen D. Wetherby, of Bolivar, N. Y. It is so made that the vegetables have only to be thrown into a hopper and the crank revolved, which causes a knife frame to be rapidly reciprocated, one knife cutting the vegetables vertically and another slicing them horizontally, so they may be reduced to chunks or narrow strips, suitable to feed to stock.

A farm gate has been patented by Mr. Theodore P. Skellenger, of Morristown, N. J. The gate is attached to a post at one side of the road by means of hooks, on which are sleeves or collars, and between its upper boards is a diagonally arranged board that supports the gate, which slides up on the hooks as it is shoved backward to open the gate, the downward movement on return assisting to close the gate.

A lamp burner has been patented by Mr. Thomas C. Phillips, of Sedalia, Mo. It has a slotted wick tube, a spring sliding plate with points projecting into the tube, and to be operated by a rack and pinion, with a slotted wedge or cam for disengaging the points carried by the spring plate from the wick in the tube, thus making an improved device for raising and lowering the wicks evenly.

A windmill has been patented by Mr. Andrew J. Lindquist, of Bertrand, Neb. It has a central revolving standard or tower, and the wheel is mounted slightly to the left of the axis of the tower, so that when the wind becomes too strong the wheel will turn out of the wind, while there are devices by which the mill may be regulated to run faster or slower, and run automatically, practically regulating itself.

A rotary lamp has been patented by Mr. Charles H. Loper, of Hickory, N. C. It consists of a globe having wings on its outer surface and a lamp within it, pivotally secured upon a suitable support, with various novel features, whereby the lamp will be perfectly safe when turned by the wind, it being designed for use in front of hotels, theaters, and public buildings, to attract attention.

A method of soling and heeling boots and shoes has been patented by Mr. Arthur Chambers, of New York city. It consists in attaching to the outer edges of the sole on its upper side a marginal strip of flexible metal, projecting beyond the edges of the sole, which is to be bent or folded over a similar marginal strip attached to the welt, both the heel and outer sole being attached after this manner.

An article of felt foot wear has been patented by Mr. Walter P. Hyatt, of Matteawan, N. Y. It is provided with an upper and a clearly defined projecting sole, the sole or heel not being sewed or glued to the upper, but united by the felting process, and so that the edges of the sole may project beyond the sides of the upper if desired, and the soles and heels made of any desired thickness.

Shoe pinchers form the subject of a patent issued to Mr. Robert B. Beach, of Philadelphia, Pa. They are formed of two pivoted levers terminating in curved jaws, the outer face of the lower jaw having a shank, with a head curved upon the front edge, and the face of the head serrated or roughened, making a tool whereby lasting at the shank is made easy, and the whole upper may be lasted with the same tool.

A window ventilator has been patented by Messrs. Daniel C. Cawley and Charles P. Wall, of Pittsburg, Pa. Perforated pipes are at the bottom and sides of the window, and a pendent draught pipe extends down into the cellar, with a gas burner at its lower end, delivering hot air through the perforated pipes into close proximity with the window glass, in order to prevent vapors from condensing and freezing on the windows.

A fence post has been patented by Mr. James Hunter, of Ruff's Dale, Pa. It is a tubular fence post, consisting of two tapering sections, having serrations at the top, flared at their lower ends, with beveled edges on the inner sides of the lower ends, and notches in the sides of the sections, combined with clamps for securing the parts together, making a post not easily affected by frost, and that will hold firmly.

An apparatus for stretching and drying cloth has been patented by Mr. John H. Varney, of Hallowell, Me. This invention covers a complete arrangement of apparatus for economically heating the air and conducting it to the cloth drying chamber of the machine, which also has novel features in its construction and operation, to promote economy in the stretching and drying processes, and to give a better stretch and finish to the fabrics.

An electric annunciator target has been patented by Mr. Morris Ullman, of Washington, D. C. The target is divided into sections which have separate electrical connections, through a connecting cable, with the annunciator, which corresponds with the target, and is thus made to indicate the spot on the target struck by the bullet, the invention being an improvement on a former patented invention of the same inventor.

A protector for boots or shoes has been patented by Mr. Levi C. Rodenberger, of No. 812 Folsom Street, San Francisco, Cal. It is a plate shaped to adapt it to the form of the sole of the boot, and with its edges turned up, with straps for fastening it in position, while a heel plate is used on the heel, the improvement being especially designed for miners' rubber boots.

NEW BOOKS AND PUBLICATIONS.

ABRIDGMENTS OF UNITED STATES PATENTS ON UNDERGROUND LINES, TO JANUARY 1, 1886. By James W. Lee. Hamilton, O.: The author, 1886.

The question of underground electric conductors has recently become of immense commercial importance, on account of the constantly increasing use of electricity, and the consequent legislation that has already, in several cities, made its underground conveyance obligatory. The author of the present volume has therefore rendered an acceptable service in presenting so convenient an abstract of all that has been done in this direction up to the beginning of the year. It is the first attempt, we believe, that has ever been made to submit a thoroughly analytical digest of a given class of patents. The great importance which now attaches to certain classes of inventions will probably make such works more common in the future. Mr. Lee presents abridgments of all the patents in underground lines taken out during the period under consideration. Including reissues, these number 323. In each case, every exhibit of the patent, whether involved in drawing or specification, has been recited, and the claims quoted in full. The arrangement is chronological, with the one exception that reissues follow their originals. A full digest and index are given at the end of the volume. The book is one that will be found very useful to those working in this line of invention, and perhaps still more so to those interested in the subject in either its commercial or legal aspect.

THE BATTLE FOR BREAD. Sermons by T. De Witt Talmage, D.D. New York: J. T. Ogilvie & Company.

HEALTH CULTURE, AND THE SANITARY WOOLEN SYSTEM. By Gustav Jaeger, M.D. New York, 1886.

Starting with the comparatively harmless proposition that wool is the most wholesome covering for the human body, the theory has flourished and expanded, under the skillful culture of its chief disciple and exemplar, to such a marvelous degree that now it completely envelopes its followers in the chosen material. From head to foot, those who want may now employ the one and only suitable fiber that nature, according to Dr. Jaeger, has provided for the protection of their persons. Though we are disposed to regard this small volume of essays as a most successful work of the imagination, we can fancy that by calling attention to the necessity of exercising more thought in the matter of our clothing, and the propriety of admitting more air into our sleeping apartments, it may accomplish some compensating good. But when, in discussing the sanitary effects of colors on woolen goods, he gravely states that he could run from eight to twenty-four hundred meters in a brown suit, while he could only run eight hundred in a black of indigo dye, and was completely exhausted at five hundred meters when the dye was of logwood, our belief in the unlimited powers of his imagination is apt to affect the context as far as both covers. It is such stuff as this that has given the author the sobriquet of the woolen clothes crank.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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) C. F. W. D.—Rubber has been suggested before as a defensive armor. It is too costly and ineffectual. Modern projectiles will pass through it.

(2) H. T. asks: 1. Is it practicable to punch a one-eighth inch hole in three-eighths inch half round iron three-eighths inch thick? I have tried to do it, but the punches break off in coming up. A. The hole may be punched in soft three-eighths inch iron, but the work is tedious and uncertain. Have you tried lubrication with oil and a die hole three-sixteenths inch diameter? This gives relief. 2. A receipt for coloring a double-barreled shot gun? A. For browning and bluing gun barrels, see note and query No. 18, Dec. 5, 1885. 3. Which is the best steel in use for dies used for drop forgings? A. You require what is called a low steel, Sanders No. 4, Sanders Steel Works, Syracuse, N. Y., or the Midvale mild steel, Midvale Steel Co., Philadelphia, Pa. Double shear is also good.

(3) J. R. asks: 1. What will prevent specimens from the dissecting room shrinking when dried—a larynx, for instance? A. It cannot be done. When the watery constituents are withdrawn, the specimen necessarily shrinks. If it is thoroughly soaked in glycerine, the shrinking will be less, for the drying is less complete. 2. What coloring matter (red preferred) will stain the muscular tissue of the larynx, without staining the cartilaginous portions, when the whole is dipped in? A. Aniline red dyes the muscular parts more deeply than the cartilaginous, but both are colored. Picro-carmine dyes the cartilage yellow, and the muscle red.

(4) J. M. asks the cause and the cure of something which causes the trembling of the lips, and which prevents a free and composed manner when attempting public speaking, and sometimes when in conversation, if one feels he is the center of interest and attraction? A. This is a matter for discipline, and not for medicine. All that can be done in the way of general invigoration of the system will be of some service, but it will be only partial. The relief and the victory must come by personal effort at self-control and by perseverance and practice. It is not "weakness of the nerves," it is a habit of yielding to mental timidity. Patient effort will surely overcome the evil eventually.

(5) C. H. N. writes: I hold that the king, when moved to a square adjoining the adverse queen, which is pinned by a bishop, is not in check from queen. A. The queen always retains her powers, whether pinned or not. On this fact have been founded some brilliant problems. The rule of chess is strict in all cases, namely, the king cannot move *into* check.

(6) E. S. D. asks how many gallons per day (24 hours) will be required to supply the evaporation from an acre of land while it is covered with water 12 in. deep? A. The rate of evaporation depends upon the temperature of the water and the dryness, temperature, and velocity of the air. The published tables give as the average of fresh water evaporation in a calm 0·225 of an inch hourly, at a water temperature of 65° F.

(7) A. G. A., Jr., asks why the smoothing iron is called a "sad iron"? A. Because the original first meaning of the word sad was heavy, weighty, ponderous, a sense in which the word has now become obsolete.

(8) C. I. J. asks (1) a receipt for making a good face powder, and perfume to mix with it. A. Take of wheat starch 12 pounds, powdered orris 2 pounds. Mix together, and add attar of lemons ½ ounce, attar of bergamot and cloves each 2 drachms. 2. How to dry and mix the powder, so that when dry it will not be lumpy. A. See "A Comprehensive Treatise on Perfumery," with thorough practical instructions and careful formulas, by R. S. Cristiani, price $5.00.

(9) G. C. asks: 1. Is the pressure of the explosive used in a gun as great against its breech as is the impact of the projectile upon the object shot at? A. The impact is measured by mechanical energy; the powder force by pressure. The two cannot be compared. 2. Does the ball increase in velocity after leaving the muzzle? A. No. It decreases from the moment of leaving the muzzle. 3. Is the undulatory theory of sound still unquestioned in the world of science? A. The "undulatory theory" was inexactly named. Vibratory theory is nearer truth, and this is generally received.

(10) W. W. S.—It is extremely doubtful if your form of multicharge cartridge could be made practicable. Dynamite is too quick for such a cartridge. Diamonds can be easily broken with a hammer and pulverized. They are ground into shape by diamond dust on an iron disk, sometimes by direct friction against another diamond; sometimes the first rough shaping is done by cleaving with a hammer and chisel, or by cutting with an iron wire and diamond dust. Vegetable oil is used with the dust to make it adhere.

(11) W. A. B. asks: 1. Is there any difference in the power required to drive a crank or an eccentric, they being of equal stroke? A. The crank has the least friction. 2. Will a crank transmit as much power, placed say two feet from the driving pulley on a 2½ inch shaft, as it would were it placed within six inches of the pulley? A. There is no perceptible difference.

(12) R. G. W. asks: 1. What are the most accurate timepieces made? A. Astronomical clocks and chronometers. 2. How accurate will they run? A. Within one second a month. 3. How accurate will the best watches run? A. 2 to 5 seconds per week.

(13) J. H. G. asks which will retain heat the longest—a solid, square piece of iron or a hollow piece of the same size filled with water, both being heated to the same temperature; and will the bottom of the piece filled with water be as hot as any other portion of it? A. The specific heat of iron is 0·1138 that of water. Its sp. gr. is 7·788 that of water. Therefore its specific heat per unit of volume is nearly 0·9 that of water, so that if nothing but radiation took place the vessel of water would cool a very little quicker. If convection and evaporation came into play, the water vessel would cool still quicker. The bottom of a vessel of hot water will cool fastest if the sides are exposed.

(14) W. H. B. asks: What chemicals or acids are used to stain glass windows, and for other purposes indelibly? A. The coloring used in producing glass consists of ordinary metallic oxides mixed with oil of lavender or oil of turpentine and afterward baked on. Preparations of paper are used, which are applied directly to the glass. See Miller's Art of Glass Painting, which we can mail for $2.25.

(15) M. N. L. asks: 1. Is there any advantage or gain in steam jacketing the cylinder of an engine with live steam from the common supply? A. This is a mooted question among engineers. The present practice is against it thus far, the waste of heat by jacketing being considered more than the power gained. Thorough lagging—with mineral wool under the lagging—and the later valve and clearance improvements, seem to have cast the steam jacket entirely into the shade. 2. How does the tensile strength and the resistance of crushing strain of different metals compare? A. The comparative tensile and crushing strength varies very much in different kinds of metals, as well as in different conditions of the same metal. See tables of strength of materials in engineering works, Haswell, Nystrom, and others, which we can furnish. 3. What is the tensile strength of phosphor bronze? A. 40,000 to 50,000 pounds per square inch.

(16) J. S. H. asks how to make a paint or varnish to render wood waterproof, and that will resist ordinary lye. Something that can be applied cold and dries quickly preferred. A. We know of nothing that will quite do what is asked. Try paraffine, melted into the wood surface with a hot iron.

(17) A. C. G. asks how the product from a ton of bituminous coal, in the form of ordinary coal gas used for heat, would compare with the ton of coal utilized in the ordinary way; that is, if 1¼ tons of coal will produce 1 ton of pig iron, how nearly would the amount of gas ordinarily obtained from the same amount of coal produce the same amount of iron? A. Under ordinary circumstances, the amount obtained is from 15 to 25 per cent, but it varies widely, according to the nature of the coal and the rapidity of the distillation of the gas. The fact that gas can often be burned more economically than solid fuel adds another factor to the commercial statement of the problem.

(18) C. M. B. writes: We have two dams across the Androscoggin River at this place, and when the water is at a certain pitch the sheet of falling water on the Topsham end of the lower dam presents a peculiar wavy appearance, and then a rattling of doors and windows occurs. Is it caused by the concussion of the air, or by the vibration of the ground? A. What you mention is a common phenomenon where there are wide sheet spill dams. The vibration of the water causes the air to vibrate, which is transmitted to considerable distance. The vibration of the air also extends to the ground, and sets buildings to vibrating. It can be stopped by breaking up the sheet of water into irregular divisions, or notching the dam so as to have thick and thin sheets in different sections. This breaks up the synchronism of the vibration.

(19) W. E. asks: What proportions of gas and air would explode with the most economy in a cylinder? Also would six cells of telegraphic gravity batteries be sufficient to ignite the gas in said cylinders? And if not, what would be required to do so? A. Mix one volume of gas with from seven to twelve volumes of air. The battery mentioned would, in connection with a spark coil or induction coil, be enough. Usually the gases are ignited by a small flame kept constantly burning and at intervals aspirated into the cylinder.

(20) Subscriber asks: Is there any substance I may add to water that will prevent white silks and satins from turning slightly yellow, as is the case when washing them in pure water? A. Use sulphurous acid if you wish a bleaching action; or as a coloring agent use a little litmus or indigo. The latter, by imparting a slight bluish tinge, tends to overcome the effects of the yellow coloration.

(21) M. F. T. asks: 1 What chemicals of moderate cost will generate the most carbonic acid gas and do it most quickly? A. Sulphuric acid and pulverized marble are generally used, as being, under ordinary conditions, the cheapest and best. 2. What amount of material will it take to generate 1,000 cubic feet of carbonic acid gas? A. For 1,000 cubic feet of carbonic acid gas, 212 pounds of limestone and 259 pounds of sulphuric acid would be required. 3. Supposing that a tank was placed in the generator containing sulphuric acid, would heat enough arise to boil the acid while generating, providing there was a free escape of the gas? A. Enough heat would not be generated. 4. How long will a magnetized cast steel bar of 75 pounds weight retain its magnetism, and from what distance would it lift a ten pound weight of wrought iron placed beneath it? A. Magnetism may be retained for years. But as your bar would be a single one, and no keepers could be employed, it would gradually weaken. The distance from which it could lift a ten pound weight would be very small, not over an inch or less. 5. How low is it possible to get the melting point of a solder or metallic composition for fire plugs? A. It may be as low as 150° to 160° Fah.

(22) F. B. asks: 1. If two feet of air at 60° temperature be compressed to one foot, what will be the increase of temperature, and will the increase always be in the same proportion for every time the pressure is doubled? Will there be the same number of degrees of heat absorbed while expanding that was given off while compressing? A. Two cubic feet at 32° compressed without loss of heat (adiabatically) to one cubic foot will rise in temperature 161° F.; for compression to one-half a cubic foot, 214° additional; for the next compression to one-quarter of a cubic foot, 284° additional—a total of 659° F. The exact reverse takes place in expanding. 2. In using salt water in a marine boiler, what is the limit of density in general practice, by the salinometer? A. Two thirty-seconds density, or blow off one-half the water in the boiler when it gets above that.

(23) A. C. E. writes that a substitute for meerschaum and ivory has been discovered, and is being manufactured in France, and asks the process. A. An imitation of meerschaum for common pipes is made of hardened plaster of Paris, treated with paraffine and colored by gamboge and dragon's blood. A peculiar preparation, into which potato largely enters, is said to have been employed as an imitation in France, but of this we have not the particulars. The imitations of ivory are probably celluloid, concerning which see the articles contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 227 and 265.

(24) H. H. W. asks: Can weight be displaced by means of electricity? A. Weight cannot be displaced by means of electricity. It can only be sustained by its agency, as it can be supported by a rope.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

August 10, 1886,

AND EACH BEARING THAT DATE.

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

Adding machine, W. Koch 346,925
Adding machine, A. Lapeyre 346,927
Advertising device, J. W. Knell 346,924
Alarm. See Burglar alarm. Electric alarm.
Baby jumper, etc., combined, O. S. M. Cone 347,092
Bag holder, H. K. Wealand 347,077
Bale tie, cotton, J. H. Hooks 346,917
Barrel register, automatic electric, G. W. Hey 347,038
Base board and wainscoting, G. F. Decker 346,899
Battery. See Electric battery. Secondary battery.
Bed, turn-up, D. C. Otis 347,009
Bedstead, wardrobe, F. B. Williams 347,217
Bedsteads, attachment for wardrobe, F. B. Williams 347,079
Beehive, E. Armstrong 346,883
Bell, door, H. A. Bierley 347,221
Bell, door, C. W. Bullard 347,226
Bell, pneumatic signal, J. A. Maloney 347,183, 347,184
Bicycle handle, F. H. Morse 347,064
Bit. See Bridle bit.
Block. See Building block. Wire drawing block.
Board. See Drying board.
Boiler. See Steam boiler.
Boiler flue cleaner, J. H. Weitmyer 347,145
Boot or shoe, A. Chambers 347,090
Boot tree, A. R. Wellman 347,309
Boots or shoes, machine for turning, J. W. D. Fifield 347,233
Bottle, nursing, W. F. Ware 347,018
Bottle stopping mechanism, G. A. Gessner 347,031
Box. See Ballot box. Musical box. Squib box.
Box forming machine, E. M. Jewett 347,299
Brake. See Car brake. Wagon brake.
Breastpins, pin tongue for, L. Dreyfus 347,289
Brick machine, W. E. Tallcot 347,136
Brick machine, H. Martin 346,931
Bridge gate, H. J. Rohrbach 347,065
Bridle bit, A. Buermann 347,226
Bridle bit, N. E. Springsteen 347,209
Broom handle extension, Greene & Egnor 347,270
Brushes, manufacture of, P. J. Kane 347,048
Buckle, W. V. Kay 347,114
Buckle, W. D. Stratton 347,015
Buckle and trace or breeching loop, combined, W. V. Kay 347,115
Buckle, suspender, C. Voorhis 347,143
Budding trees, H. Gulick 346,905
Bung, C. Ives 347,046
Burglar alarm, H. B. Bray 347,086
Burner. See Gas burner. Lamp burner.
Burning hay, double-walled magazine for, J. H. Coon 346,985
Button, C. C. Shelby 346,956
Button, cuff, G. Meiners 347,035
Button fly scalloping machine, C. B. Hatfield 347,105
Buttonhole cutter, H. H. Barnard 346,977
Cables, splice for underground, W. R. Patterson 346,942
Calipers, T. C. Hendey 346,915
Calipers for inside and outside measurement, C. Tepel 347,016
Can. See Milk can.
Can opener, J. Sample 347,067
Capsule filling machine, R. Walsh 346,964
Capsule stripping machine, J. Krehbiel 347,274
Car brake, R. R. Hice 347,039
Car brake, automatic, C. V. Rote 347,010, 347,011
Car brake, electro-magnetic, Timmis & Forbes 347,075
Car coupling, Copland & Gilmour 346,966
Car coupling, J. Harrison *et al* 347,035
Car coupling, M. Maher 347,001
Car coupling, J. H. B. McCray 347,121
Car coupling, C. E. Michaud 346,936
Car coupling, Miles & Dunne 347,006
Car coupling, T. H. & E. V. Snyder 347,208
Car coupling, Wroe & Hah 346,975
Car door lock, M. L. Manley 347,185
Car gate, railway, T. W. Peeples 347,057
Car spring, R. Vose 347,281
Car wheel and axle, W. Malam 347,119
Cars, dumping device for mining, W. J. Renniman 347,151
Cars, etc., to denote the number of passengers and the distance and time ridden, recorder for, J. Bisset, Jr 347,153
Carbon battery, spongy, E. Berliner 347,023
Carbons, apparatus for making, J. T. Lister 347,247
Carbureting apparatus, gas, W. F. H. O'Keefe 346,940
Card, game, F. D. Owen 347,192
Carrier. See Cob carrier. Hay carrier. Shuttle carrier.
Cartridge shells, sectional, H. W. Libby 347,051
Cartridges, machine for loading, E. A. Franklin, 347,030, 347,268
Case. See Collapsible case. Music case. Watch case.
Cash check device, J. H. Smith 346,955
Cash register and indicator, C. B. Hopkins 347,296
Caster, W. P. Tracy 347,261
Chair, Dexter & Chase (r) 10,754
Check rower, R. Faries 347,168
Chisel, J. Roberts 346,948
Chuck, hollow spindle, A. E. Elmer 347,167
Churn, W. G. Wise 347,020
Cigar bunching machine, F. C. Smalstig 347,257
Cigar tray, G. Laube 347,182
Clasp. See Corset clasp.
Cleaner. See Boiler flue cleaner. Boiler tube cleaner. Tobacco pipe cleaner.
Clipper, hair, Smith & Priest 347,207
Clipping machine, E. M. Burgess 347,263
Clock pendulums, electrical device for synchronizing, H. Whiting 346,970
Clocks, music box attachment for, C. H. Jacot 347,047
Clod crusher and pulverizer, F. Evison 347,098
Cloth, apparatus for stretching and drying, J. H. Varney 347,212
Clothes drying apparatus, J. W. Miller 347,248
Clutch for lifting jacks, A. A. Strom 347,279
Coal or other fuel, compound for perfecting the combustion of, G. White 347,078
Cob carrier, F. Irwin 346,919
Cock, fluid, P. A. Bowen 347,156
Coffee pot, M. A. Henderson 346,914
Coffin, Gould & Baldwin 347,172
Coloring yarn, machine for, S. Sanford 346,950
Cooler. See Milk cooler. Water cooler.
Corset and garment supporter, combined, H. M. Bortree 346,982
Corset clasp, F. F. Delpy 347,094
Corsets, stiffening material for, J. F. J. Gunning 347,084
Cotton picking machine, M. Platt 347,058
Counter, store, J. A. Cooper 346,896
Coupling. See Car coupling. Thill coupling.
Crate, H. W. Ream 347,198
Crusher. See Clod crusher.
Cultivator, G. E. Briggs 347,087
Cultivator, G. Bettschen 347,083
Cultivator, J. A. Johnson 347,273
Curtain, rolling, O. Kluge 346,999
Cut-off and filter, rain water, W. R. Scott 347,208
Cut-out, multiple series, C. F. Brush 347,025
Cutter. See Twine cutter. Vegetable cutter.
Damper regulator, N. Curtis 346,898
Desk and book case, combined double, C. E. Ruth 347,278
Digger. See Potato digger.
Ditcher and grader, combined tile, F. C. Woodard 347,282
Door hanger, J. G. Hyatt 347,109
Door lock, sliding, H. S. Lockwood 346,928
Door, safe, W. H. Baynard 346,980
Drawers, support for, G. Morrow 347,276
Drawing apparatus, A. C. Feron 347,099
Dust collector, N. W. Holt 347,243
Dusters, adjustable handle for, E. G. Nunn 347,123
Earth closet, W. Heap 347,037
Earthenware and glassware, and ornamenting the same, D. S. Plumb 347,195
Ejector, fluid, C. White 346,967
Electric battery element or electrode, E. T. Starr 347,259
Electric battery, secondary, E. Julien 347,300
Electric battery, secondary, A. De Khotinsky 347,231
Electric lock and bolt moving mechanism, F. Sedgwick 347,070
Electric machine regulator, dynamo, S. H. Short 347,204
Electric machines, armature for dynamo, E. P. Warner 346,965
Electric welding, E. Thomson 347,142
Electric welding, apparatus for, E. Thomson, 347,140, 347,141
Electrical conductor, J. R. Finney 346,990
Electrical meter, W. L. Stevens 346,957
Electrotype registering machine, A. O. Russell 347,256
Elevator. See Hay elevator. Water elevator.
Engine. See Fire engine. Gas motor engine. Rotary engine. Steam engine.
Evener, four horse, A. T. Masten 346,952
Extension table, G. Erber 346,903
Fabric turfing implement, J. J. Deal 347,163
Fan, automatic, D. W. Porter 347,255
Fan, exhaust, G. Campbell 347,227
Farm gate, C. W. Benschoter 347,152
Faucet, E. U. Scoville 347,131
Feed trough, poultry, M. D. Beach 347,081
Feed water heater, Clarke & Flynn 347,228
Felt foot wear, W. P. Hyatt 347,110
Fence machine, portable, Middaugh & Wilcox 347,190
Fence machine, wire, W. H. Reppeto 347,064
Fence post, J. Hunter 347,288
Fence wire reel, I. High 347,241
Fences, machine for making picket, G. & L. Kesling 346,923
Firearm lock, J. S. Patterson 346,941
Firearm, magazine, G. N. Spencer 347,072
Fire escape, G. C. Hale 346,907
Fire extinguisher, C. H. & F. Westcott 347,216
Fire extinguishers, automatic sprinkler for, A. M. Granger 347,033
Fire kindler, H. D. Henderson 347,176
Fire screen, Collins & Grant 347,091
Fires, apparatus for automatically extinguishing, W. H. Percival 347,194
Fish bait, spinning, J. B. McHarg 347,122
Frying pan and baker, Crawford & Mundy 347,093
Furnace. See Gas furnace. Glass melting furnace. Heating furnace. Hot air furnace.
Furnace grate, J. Walrath 347,214
Fuse for blasting, electric, J. P. A. Scola 347,013
Game, M. D. Bullock 346,892

Gas burner, E. Bourne 347,155
Gas conduits, casing for natural, Blackmore & Steen 347,084
Gate. See Bridge gate. Car gate. Farm gate.
Glass melting furnace, U. Houze 347,045
Glass windows, manufacture of stained, Charmantier & De Cazenave 346,984
Glassware, manufacture of, G. W. Blair (r) 10,753
Gluing machine, G. W. Glazier 346,992
Grinding mill, W. T. Dougan 347,232
Gun carriage and shield, H. C. E. Malet 347,002
Hair crimper, I. W. Heysinger 347,177
Hame fastener, S. V. Halloway 346,908
Hame fastening, R. C. & C. W. Uecke 347,076
Handle. See Shawl strap handle.
Hanger. See Door hanger. Eaves trough hanger.
Harness, R. H. Coatsworth 347,229
Harness, Tourgee & Jennings 347,210
Harness, draught equalizing, G. B. Freeman 347,290
Harrow, B. C. Converse 346,895
Harrow, J. Hildesheim 347,106
Harrow, H. M. Strange 346,959
Harvester and binder, Black & Miller 347,236
Harvester, corn, R. H. Morrow 347,301
Harvesting machine, H. Black 347,285
Hay carrier, A. L. Jordan 347,178
Hay elevator, W. Louden 347,052
Hay fork, horse, N. J. Nilson 347,253
Hay press, J. G. Morton 346,937
Heater. See Feed water heater.
Heel attaching machine, F. F. Raymond, 2d 347,061
Heel nailing machine, F. F. Raymond, 2d 347,062, 347,063
Hides or skins, machine for breaking, P. Diehl 346,900
Hinge, friction, C. P. Oudin 347,124
Hitching strap, G. C. Hale 346,906
Hitching strap and buckle therefor, C. W. Beck 347,082
Hoisting bucket, W. P. Myer 347,302
Holder. See Bag holder. File holder. Necktie holder. Oil can holder. Package holder.
Hook. See Snap hook. Whiffletree hook.
Horse rake, S. Ritty 346,947
Horses, appliance for training, I. A. Dodge 346,989
Hub, vehicle wheel, Hoefer & Blechschmidt 347,040
Hydrant, E. Schlenker 346,951
Hydraulic press, G. Griffin 347,237
Hydraulic press, C. E. Heiss 346,918
Incandescents, manufacture of, A. De Lodyguine 347,164
Incubator, W. Miller 347,249
Incubators, heat regulator for, G. A. Muenchinger 346,938
Index, P. J. Schlicht 347,304, 347,305
Indicator. See Steam engine indicator.
Inhaler, W. H. Hamersly 346,909
Injector, Jenks & Hart 347,245
Insulator, telegraph, J. Wilson 346,971, 347,972
Iron. See Sad iron. Soldering iron.
Iron, machine for straightening bar, R. T. Barton 346,884
Ironing table, J. E. Bowman 347,287
Irrigation, system of, G. W. Jessup 346,920
Jack. See Window jack. Lifting jack.
Jar cover, J. Doherty 347,095
Joint. See Rail joint.
Key board player, R. T. Smith 347,184
Key fastener, W. C. Gere 347,170
Kiln. See Brick kiln. Lime kiln.
Knife. See Cheese knife.
Lampblack, apparatus for manufacturing, J. Wilson 346,973
Lamp burner, E. Blackman 346,889, 346,890
Lamp burner, T. C. Phillips 347,126
Lamp burner, H. E. Shaffer 347,132
Lamp burner holder, G. S. White 346,968
Lamps, carbon holder for arc, D. Williamson 347,218
Lantern, magic, Gray & Kemp 346,994
Lantern, signal, N. M. Crawford 346,897
Latch and lock, combined, E. R. Ferry 347,100
Lathe for irregular forms, W. H. Hawley 347,036
Leather cutting die, H. Loeser 346,929
Life preserver for vehicles, J. S. Goldsmith 347,269
Light deflector, Kaiser & Adt 347,113
Lock. See Car door lock. Electric lock. Nut lock. Permutation lock. Safe lock. Sash lock. Seal lock. Time lock.
Locks, locking and releasing mechanism for, W. C. Fisher 347,029
Locomotive brake, H. A. Wahlert 347,017
Loom heddle, wire, F. Taylor 347,138
Loom shuttles, tension regulating device for, Hazard & Greenhalgh 346,912
Looms, etc., thread guide for, J. Dalton 347,028
Lubricator, P. A. Bennett 347,284
Lubricator, W. H. Bingham 346,981
Matches, manufacture of, W. E. Doolittle 346,265
Mechanical movement, U. Haskin 347,294
Metal, apparatus for compressing cast, E. B. Meatyard 347,003
Metal, apparatus for compressing fluid, E. B. Meatyard 347,004
Metal rods, machine for rounding and polishing, Perry & Gordon 346,943
Meter. See Electrical meter.
Milk can, C. L. Hall 347,174
Milk cooler, J. H. Bramkamp 347,085
Mill. See Attrition mill. Grinding mill.
Mine doors, operating, P. F. Snyder 347,135
Motion, device for converting reciprocating into rotary, G. N. Tibbles 346,961
Motion, mechanism for converting, J. J. Collins 347,230
Motor. See Electric motor.
Mower. See Lawn mower.
Mower, lawn, O. Zistel 347,311
Necktie holder, L. R. Goodwin 346,993
Necktie holder, J. S. Temple 347,073
Newspaper clip, T. & A. S. Fix 346,904
Nut lock, J. W. Anderson 347,147
Nut, prop, H. Higgin 347,240
Nuts, machine for making crowned, R. T. Barton 346,885
Oat hulling machine, Matthias & Rudolph 346,933
Oatmeal machine, Matthias & Rudolph 346,934
Oiler, E. Moat 347,251
Oven, baker's, S. Lamoureux 347,181
Package holder, Gaunt & Allen 347,235
Packing for piston rods, adjustable, W. Pohlman 347,197
Pad. See Bath pad.
Padlock, permutation, G. F. Seiser 346,954
Pan. See Baking pan. Dust pan. Frying pan.
Paper and other fabrics, machine for sizing and coloring, H. F. Case 346,894
Paper cartridge shells, heading, A. Dickerman 347,166
Paper folding machines, feeding table for, R. T. Brown 347,224
Paper from the tobacco plant, manufacture of, W. W. Bennett 346,887
Paper pulp, rag engine for beating, J. H. Horne 347,043
Paper shells for cartridges, mechanism for cupping, A. Dickerman 347,165
Paper stock or wood pulp, etc., treating articles made of, Robinson & Cothren 347,200
Paraffine and extracting oil from oleaginous materials, purifying, F. X. Byerley 347,288
Pasting machine, A. Kingsbury 347,246
Permutation lock, electro magnetic, F. Sedgwick 347,068
Photographic printing frames, automatic register for, Guthrie & Peterson 347,292
Pinchers, shoe, R. B. Beach 346,886
Pipe. See Stove pipe.
Pipe and nut wrench, J. H. Bowers 347,157
Pipe joints and producing the same, cold packed, A. N. Rankin 347,060
Planing machines, presser attachment for, G. W. Passel 347,254
Planter, J. Dunkin 346,901
Planter, peanut, J. R. Ayers 346,976
Planter, potato, Lord & Cheevers 347,275
Plastering strip, G. Ahrens 347,080
Platform or scaffold, Murphy & Weinman 347,055
Plow, A. J. Gale 347,102
Plow, combination, A. A. Weinmann 347,144
Plow or cultivator, A. Beard 347,220
Plow point, J. A. Tigner 347,074
Plow stock, Barnett & Adams 346,978
Post. See Fence post.
Post and pile driver, A. Towberman 347,211
Post driver, A. S. Reisor 347,128
Potato digger, E. Hoy 346,918
Press. See Baling press. Lead press.
Pressure regulator, G. W. Lawton 347,118
Printing machine, oscillating cylinder, J. T. Hawkins 346,911
Printing machines, sheet delivery for, J. T. Hawkins 346,910
Protector. See Boot or shoe protector. Game protector. Pantaloons protector.
Pump, O. Junkerman 347,112
Pump, gas engine, F. B. Taylor 347,137
Pumps, rubber bucket for chain, M. D. Temple 346,960
Pumps, heater and condenser for steam force, W. S. Wandell 347,215
Rack. See Clothes rack.
Radiator, J. R. Reed 347,127
Rail brace, P. F. Barr 346,979
Rails, roll for rolling girder, T. L. Beaman 347,283
Rails, rolls for rolling fish bars from old, G. Wostenholm 347,310
Railway coaches, etc., cuspidor for, J. B. McLain 347,189
Railway, pneumatic and electric, E. F. Edgar 346,902
Railway signal, J. H. Reinhardt 346,946
Railway track, metallic, D. Kaufman 346,998
Railway tracks, constructing, T. H. Gibbon 347,236
Railways, automatic suspended switching device for electric, C. J. Van Depoele 346,963
Railways, tie truss for, S. G. Scott 347,129
Rake. See Horse rake.
Ranges or stoves, garbage attachment for, G. Brown 346,891
Reel. See Fence wire reel.
Refrigerator, F. S. Gwyer 347,293
Refrigerator, J. Shriver 347,205
Refrigerator and table combined, C. Weitz 346,966
Refrigerator, butter dish, T. B. Kavanagh 347,049
Refrigerating attachment for beer kegs, T. Kelpien 347,117
Register. See Cash register.
Regulator. See Electric machine regulator. Pressure regulator.
Rein, check, F. T. Davis 347,162
Rheostat, R. H. Mather 347,120
Road engine, S. E. Worrell 346,974
Roaster. See Coffee roaster.
Rocking seat mechanism for operating churn dashers, etc., A. B. Kökernot 346,926
Roller. See Printing roller.
Rolling I beams, machine for, E. B. Meatyard 347,005
Rotary steam engine, J. Hills 347,242
Sad iron, E. J. Baker 347,148
Safe lock and bolt moving mechanism, electric, F. Sedgwick 347,071
Sash lock, E. R. Ferry 347,101
Saw, D. R. Proctor 347,008
Sawmill feed mechanism, W. J. F. Liddell 347,000
Saw set, R. E. Poindexter 346,944
Scale, weighing, P. H. O'Neill 347,056
Screen. See Carriage screen. Fire screen. Window screen.
Seal lock, M. Kersten 347,180
Seal lock, S. W. Neall 347,191
Seat. See Rocking seat.
Secondary battery, E. T. Starr 347,258
Separator. See Cockle separator.
Sewing and other machines, stop mechanism for, J. W. Lufkin 347,053
Sewing machine needle bar cover, W. Carr 347,089
Sewing machines, buttonhole sewing attachment for, Smith, Jr., & Williamson 347,133
Shawl strap handle, I. Scheuer 347,201
Shoe clasps, catch plate for, S. A. Chapman 346,983
Shoe clasps, catch plate for, H. S. Pullman 346,945
Shoe, felt, W. P. Hyatt 347,111
Shoe soles, machine for shaping, O. F. Knox ..... 347,0[illegible]
Shoes, attachment for rubber, P. L. Ross ..... 347,0[illegible]
Shutter worker, L. Schuermann 347,202
Sifter, ash, G. W. Milner 347,250
Signal. See Railway signal.
Signal tube apparatus. J. W. Black 347,154
Signaling apparatus, automatic block, T. W. Burt 346,893
Signaling apparatus, electrical, T. A. Edison 347,097
Sleigh knee, hinged, J. J. Gardner 347,163
Snap hook, G. M. Hubbard 347,108
Snow in railway cuttings, preventing accumulation of, W. L. Howie 347,107
Soap, etc., making laundry, N. J. Clute 347,027
Soldering iron, S. P. Swartz 347,307
Sorting machine for classifying wooden stuffs, Cuvier. Fils, & Gourand 347,264
Spike machine, U. Haskin 347,295
Spring. See Car spring. Vehicle spring. Wagon bolster spring.
Stand. See Switch stand. Wash stand.
Stave jointing machine. R. C. Pope 347,059
Steam boiler, G. Steele 347,014
Steam boilers, compound water gauge for, D. Pyke 347,303
Steam engine, J. S. Ash 347,219
Steam engine indicator, W. F. Brown 347,088
Steam engine, oscillating, S. W. Hempsted 346,996
Steam engine, reciprocating, M. Geary 347,104
Steam generator, T. Drake 347,266
Stereotype shaving machine, E. A. Blake 347,222, 347,223
Stop box, P. White 346,969
Stopper. See Hawse pipe stopper.
Stove, D. M. Murray 346,939
Stove, lamp, H. McConnell 347,187
Stove, leg, Berry & Parker 346,888
Stove ovens, sliding grate attachment for, M. L. Miller 347,007
Stove pipe, extensible, J. S. Beebe 347,150
Stove, vapor, S. Daniels 347,161
Stoves, vapor burning attachment for, H. McConnell 347,188
Supporter. See Axle supporter.
Surgical chair, E. Bonnefoy 347,024
Suspension device, J. D. Griswold 346,995
Switch. See Railway switch.
Table. See Dressmaker's table. Folding table. Ironing table.
Tack puller, F. G. Whytal 347,019
Tank. See Refrigerator tank.
Target trap, F. J. Curran 346,988
Tea pot and coffee pot handle, F. E. Baker 347,021
Telegraphic key. R. A. Macready 346,930
Telephone receiver, W. C. Turnbull 346,962
Thill coupling, A. Z. Fryberger 347,291
Thill coupling, M. E. Hamilton 347,238
Thrashing machines, band cutter and feeder for, J. W. Turner 347,280
Time lock, electro magnetic, F. Sedgwick 347,069
Timepieces, compensation balance for, G. E. Hunter 347,297
Toaster, C. W. Stambaugh 347,306
Tobacco pipe cleaner, J. F. Forth 347,169
Top, F. L. Johnson 346,921
Top, musical, R. Richardson 347,199
Top, spinning, J. S. Gold 347,062
Toy air gun, P. D. Horton 346,244
Trace fastening, W. E. Barber 347,149
Track clearer, G. F. Chapman 347,026
Trough. See Feed trough.
Truck, P. V. McBride 347,186
Truck, barrel, E. S. Stone 346,958
Truss, A. Giralt 347,171
Tube. See Lamp wick tube.
Twine balling machine, R. A. Kelly 347,116
Twine cutter, Fogleson & Monser 347,234
Valve for engines, slide, C. Schmid 347,012
Valve operating device, C. A. Goyne 347,173
Valve, safety, W. F. Walker 347,213
Valve, throttle, Hopkins & Johnson 347,041
Valves on their seats, machine for grinding, Scoville & Owen 347,130
Vault, safe deposit, F. Foster 347,267
Vegetable cutter, S. D. Wetherby 347,145
Vehicle spring, W. Harty 347,175
Vehicle spring, D. A. Schutt 346,952
Vehicle, power driven, G. Daimler 347,160
Vehicle running gear, S. M. Chester 347,159
Vehicle, two-wheeled, T. S. Bayley 347,022
Ventilator. See Window ventilator.
Ventilating sewers, T. H. Donahue 347,096
Wardrobe, portable folding, C. K. Waring 347,308
Wash board, D. J. George 346,991
Wash stand and commode, J. Penney 347,193
Watch, G. Thommen 347,139
Watch balances, manufacture of, G. E. Hunter 347,271
Watch case, C. F. Morrill 347,252
Watch movement, G. Hunter 347,272
Water closet, G. W. Hunter 346,997
Water closet bowl, J. Kelly 346,922
Water elevator, compressed air, J. G. Pohle 347,196
Weather strip, Skinner & Brooks 347,206
Wells, device for connecting pipe to bore holes for artesian, Price & Leib 347,277
Wheel. See Car wheel. Wind wheel.
Wheels, machine for riveting and dressing, A. Crossley 346,987
Whip socket, E. W. Scott 346,953
Windlass for elevators, J. P. & C. T. Harris 347,239
Window jack, W. E. Steinbach 347,260
Window screen, J. M. Hommel 346,916
Window screen, W. W. Robinson 346,949
Window ventilator, Cawley & Wall 347,158
Wood polishing machine, J. L. Perry 347,125
Wood working machine, J. Hourigan 347,044
Wrench. See Nut wrench. Pipe wrench.
Wrench, A. Wood 347,262
Wrench and spanner, combined, J. R. Hopkins 347,042
Wrench attachment, Kelly & Hubbell 347,179

DESIGNS.

Barometer frame, F. Oertling 16,845
Bed case, folding, C. Teufel 16,851
Cracker, D. F. Stauffer 16,848, 16,849
Eyelet machines, frame for, H. L. Lipman 16,844
Inkstand, R. Sneider 16,847
Inkstand and pen rack, combined, J. G. Winger 16,852
Paper cutter, M. H. Kerner 16,843
Rug, A. Petzold 16,846
Sofa, A. Stark 16,850
Type border, G. F. Giesecke 16,842
Water closet bowl and base, R. Carlisle 16,841

TRADE MARKS.

Apricots, dried, Sherman, Marr & Higgins 13,566
Bitters, phosphorated, J. T. Hall *et al.* 13,549
Butter-scotch or taffy, W. F. Parker 13,555
Calf skins, morocco, sheep skins, and patent leather, Mayer, Michel & Deninger 13,552
Cement, Portland, Vorwohler Portland Cement Fabrik, Prussing, Planck & Company 13,568
China, stoneware, terra cotta, and statuary porcelain, Villeroy & Boch 13,567
Coffee, roasted, Mayer Brothers & Co 13,551
Compound for the treatment of female complaints, J. E. Markle 13,562
Dentifrice or tooth wash, M. A. & C. A. Santos 13,565
Flour, S. H. Cockrell & Co 13,560
Medicinal preparation for purifying the blood, A. Gross 13,548
Medicinal preparation for the feet in powdered or liquid form, C. R. Pa Dro 13,554
Medicinal remedies prepared from a certain natural deposit of earthy formation, Acid Iron Earth Company 13,547
Medicine for the cure of dyspepsia and all diseases incident thereto, J. True 13,557
Medicine, hog cholera, Medinus & Iten 13,553
Oil, lubricating, F. H. Reinhard 13,564
Oil meal and flaxseed meal, S. H. Weeks & Co 13,569
Paper, writing, Massasoit Paper Manufacturing Company 13,563
Pills, Weedon & Dent 13,558
Remedy for catarrh, J. T. Hall *et al.* 13,550
Tobacco, plug, Zane Tobacco Company 13,559
Tobacco, plug and twist, R. J. Reynolds 13,556
Wines, Compania Vinicola del Norte de Espana 13,570
Woolen bedding, certain named, Dr. Jaeger's Sanitary Woolen System Company 13,561

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