SCIENTIFIC AMERICAN

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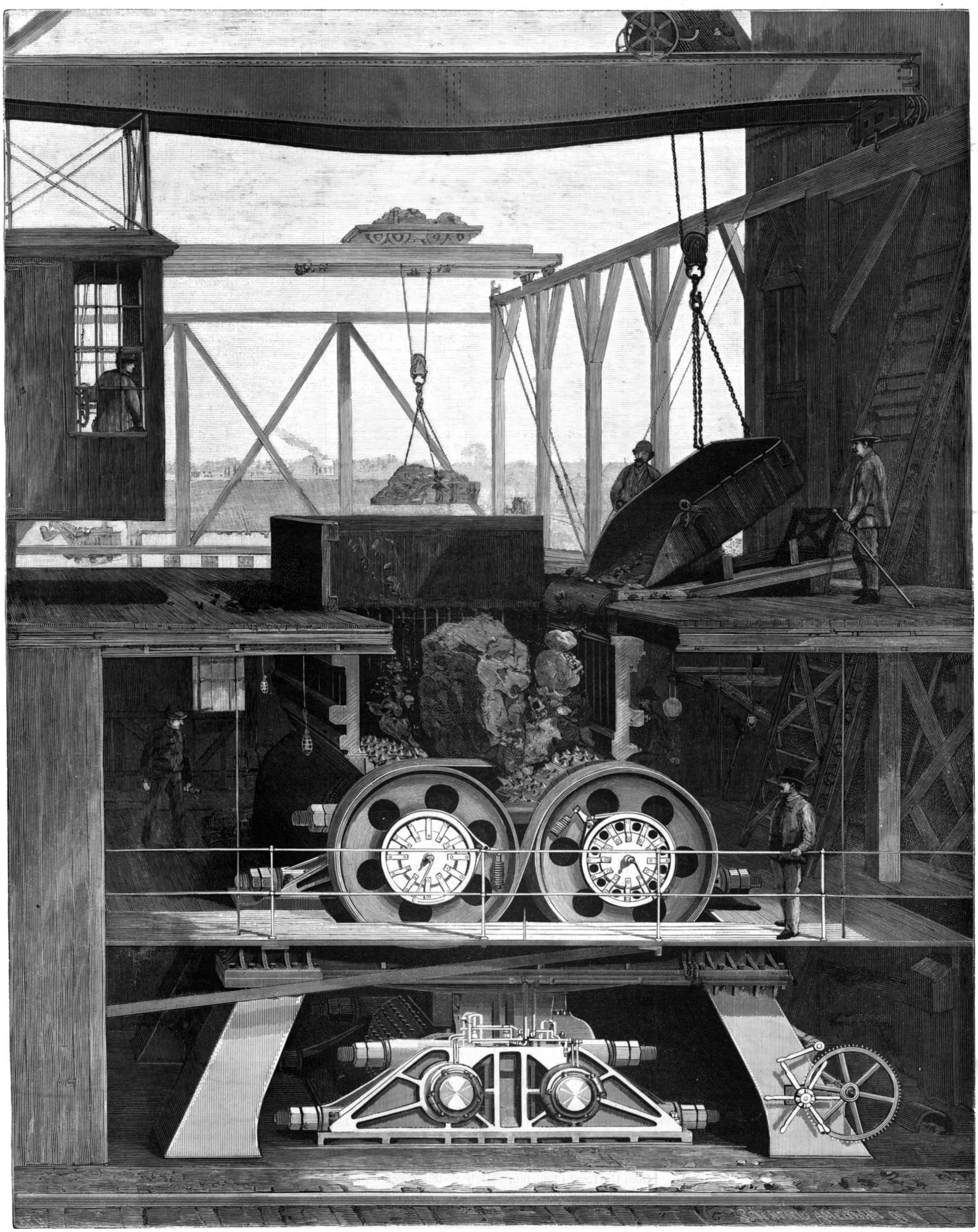

THE EDISON MAGNETIC CONCENTRATING WORKS—THE GIANT ROLLS.—[See page 55.]

Scientific American.

ESTABLISHED 1845

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NEW YORK, SATURDAY, JANUARY 22, 1898.

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(Illustrated articles are marked with an asterisk.)

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Scientific American Supplement

No. 1151.

For the Week Ending January 22, 1898.

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THE NEW YORK STATE CANALS BLUNDER.

The matter of the New York State canals improvement furnishes the latest evidence of the incredible looseness which too frequently marks the construction of our public works. The slipshod manner in which the first estimates were made, the readiness with which the committee, with the most meager, and, on the face of it, unreliable, data to go upon, passed the estimates, and the amateurish defense now set up by the State engineer in his attempt to explain why that estimate of $9,000,000 must now be raised to $16,000,000, constitute a chapter in the history of public works which would be discreditable if it related merely to the building of a country bridge or the laying of a length of village sidewalk.

The plan of improvement for which a sum of $9,000,000 was voted in 1895 included the deepening of the canals throughout their entire length of 454 miles and the lengthening of the locks throughout the system. These were straightforward engineering works of a kind which has often been executed before; it entailed no untried problems; the nature of the ground was ascertainable, and the general data was of a kind which should have enabled a closely approximate estimate of cost to be made. In his published statement explaining the enormous increase of $7,000,000 in the estimated cost, the engineer gives as one reason the fact that deepening the canal has caused the old walls in many places to slip into the canal. The public will ask how these walls could be expected to do anything less when the dredge, in deepening the canal, dug away their foundations. It is further explained that it was found to be impossible to use the material dug out of the canal for raising the embankments, as at first contemplated, and that suitable material had to be excavated elsewhere, thus entailing a double amount of excavation.

To an engineer this explanation is even less satisfactory than the last; for, surely, if there was any one thing more than another that was ascertainable from the records, it was the nature of the material met with in the first construction and subsequent maintenance of the canal.

WHY ARE AMERICAN FASTER THAN ENGLISH LOCOMOTIVES?

The persistent discrediting by The Engineer, of London, of the records attributed to American locomotives has at last given way in the face of testimony so reliable as to establish the accuracy of these records beyond a possibility of doubt. The offending parties in the present instance were the officials of the Atlantic City Railroad, who had dared to assert that they were running a regular scheduled train at a speed of sixty miles an hour, and keeping well within the schedule at that.

In the midst of a voluminous correspondence, most of which proved on à priori ground that such performance was simply impossible, there appeared a letter from Mr. Clement E. Stretton, an English authority on locomotive matters, stating that a year or two previously he had himself taken the very greatest precautions in timing a train on this particular road, and that speeds equal to and exceeding those under discussion had been accomplished. Thereupon The Engineer announced, editorially, that the time had come, at least as far as that journal was concerned, to admit that American locomotives were undoubtedly faster than English locomotives, and correspondence was invited to discuss the causes of the difference. For some weeks past a vast number of letters has been published, some of which persisted in casting doubt on the correctness of the records, while others attributed the difference to construction of track and rolling stock, and a small minority, consisting mainly of those who had visited America and seen our locomotives at work, traced the superior power and speed of our locomotives to the proper causes.

Undoubtedly the fundamental difference between the two national types lies in the boiler capacity, the American boiler having from fifty to seventy per cent more heating surface and steam-raising capacity than the English boiler. Next in importance is the larger area of the steam ports in our engines, enabling them to receive and discharge the steam freely when running at high speed; and lastly, there is the smaller diameter of the American driving wheels, giving a larger tractive effort and a higher piston speed with its consequent increase of the indicated horse power. If the loads hauled, the grades, the weather and all other modifying circumstances are the same, the speed of two trains will vary as the indicated horse power, and the indicated horse power will vary as the piston pressure and the piston velocity. Good results at the piston can be maintained by providing free passages between a boiler which can furnish ample supplies of steam and the back of the piston, and an instant release of the steam from the front of piston. High piston speed can be secured by keeping down the size of the driving wheels.

Now all of these conditions are provided in the typical American locomotive. The boiler power is liberal, extravagantly so, judged by European methods; the steam passages are large, and the piston speed is high. On the other hand, the boiler power of the English engine is relatively limited; the steam passages are cramped and the driving wheels are large, giving a low piston speed. Hence it follows, as naturally as the day follows the night, that the American locomotive can haul bigger loads or haul its loads faster than those of the English type. Whether it can do the work more economically is another question. The advantage on this score would probably lie with the English engine, which is known to be a proverbially light coal burner.

THE ARCH IN STEEL BRIDGE CONSTRUCTION.

The suspension and the cantilever systems of bridge construction have heretofore been preferred in building the largest bridges, or rather the bridges of longest single span. For lengths below five or six hundred feet the simple end-supported truss and the arch have been chosen to span the rivers or ravines, but when the proposed structure has exceeded that length, engineers have preferred to adopt the suspension or cantilever structure. The popularity of the latter forms is due to the fact that erection can be carried out without the use of falsework or scaffolding, which is not only costly, but in many cases is prohibited by the natural features of the site.

Of the four forms of bridge—the truss, the arch, the suspension and the cantilever—the arch, if artistically designed, is perhaps the most beautiful; moreover, where it is possible to erect it by the cantilever or overhang system, it is, for the longer spans, the most economical. This is due to the fact that it is self-contained and does not, like the other forms, require shore arms or anchorages to counterbalance the weight or resist the pull of the central river span. At the time when the plans for the great 1,710-foot cantilevers of the Forth Bridge were published, Mr. Max Am Ende presented an alternative plan for a bridge with steel arches carrying a suspended floor, and showed that it could be erected for less cost than the cantilever design of Mr. Baker or any design for a suspension bridge. A similar comparison was made by the same engineer when the plans of the proposed North River Bridge were published, and a similar economy was shown in favor of the arch design. It was proposed to build out the trussed arches by overhang, tying them back by steel cables to temporary anchorages on shore. Whether or not the calculations of strength, stability and cost were sound, it is certain that, once erected, an arch of this magnitude would have an imposing appearance and a beauty which could not be surpassed by either of the other systems of construction.

What will be by far the largest steel arch, or arch of any kind, ever constructed is now being built across the Niagara Gorge on the site of the upper suspension bridge. At this point the cliffs are 1,268 feet apart, and 840 feet of this opening is to be spanned by a handsome trussed steel arch. What a great advance this is upon previous construction may be judged from comparison with the new railroad arch a couple of miles down the river, which was recently completed for the Grand Trunk Railroad. This has a span of 550 feet and is only surpassed by the Louis I bridge at Oporto, Portugal, which measures 566 feet in the clear. The deck of the structure will be 50 feet wide and will provide room for two trolley tracks, two driveways and raised walks for foot passengers.

The site will be advantageous for construction as the cliffs on either side will afford good anchorage for the two halves of the arch during the time they are being built out to a connection at the center of the gorge.

ELECTRIC TRACTION ON THE NEW YORK ELEVATED ROADS.

The Rapid Transit Commission has charge of the interests of the people of New York, and in furtherance of its efforts to secure improved transit facilities it has extended a standing invitation to the Manhattan Railway Company to submit a plan for the extension and improvement of the elevated roads in this city. The invitation of the citizens' commission has been steadily ignored by the company. Only at such times as there seemed to be any likelihood of a tunnel road being built has the company had anything to say, and then it has been voluble in its expressed intention to extend and improve its system. We heard many promises of this kind when the first rapid transit tunnel scheme was under review by the Appellate Justices; and now that the Metropolitan Street Railway Company—the most powerful rival of the elevated roads—has been talking of building the tunnel, the Manhattan interests have "authorized" a "statement" of the great change they are preparing to make on their system.

The public will judge for itself of the probability of these costly improvements being made except under the spur of absolute necessity. According to the authorized statement of Mr. Gould, the system is to be electrically equipped, the present steam locomotives being replaced, either by electric locomotives, or by a system similar to that on the Chicago elevated roads, in which motors are applied to each car of the trains. If the change should be made, it will constitute by far the largest electrical equipment in existence. In every twenty-four hours as many as 3,500 trains are

dispatched over the various lines and this calls for the constant service of 330 locomotives of from 200 to 250 horse power each. If this be the case it would require from 75,000 to 100,000 horse power to operate the whole system successfully. That the change would greatly improve the system cannot be doubted. Electric traction would not only be more cleanly and less noisy, but there would be a great acceleration in the speed due to the more rapid starting power of the electric motor. At the same time it is certain that even this improvement would merely enable the elevated roads to give reasonable accommodations to their present patrons—it would leave untouched the great problem of how to handle the passengers who wish to get quickly and without a stop from the lower city to the upper districts.

SUGGESTIONS FOR LABELS AND TRADE MARKS IN CHINA.

In a report recently published from United States Consul Samuel L. Gracey, of Fuchau, China, he says: On the above subject commercial missions must bring large results to nations who take intelligent methods to ascertain the needs of the world's markets and adjust their manufactures to the demands of distant peoples. The associated chambers of commerce of England sent out an expedition which submitted to its promoters matters of interest which may prove to be of the greatest importance to English trade. In order that the United States may enlarge foreign trade, it is of the first importance that its manufacturers should know not only what suits American tastes and prejudices, but what other people like and will have, and how to prepare and deliver such goods. The establishment of a commercial museum in Philadelphia and the projecting of another in San Francisco is the first organized effort of the United States business men to supply needful information and illustrations of the world's products and demands. One of the most valuable uses of such museums is the exhibition of samples of the kinds of goods used in foreign lands and illustrations of the methods of preparing and putting up such goods as command the favor of the purchasers.

A writer in a recent number of an English commercial paper says: "Closely allied to the previous grounds of the success of foreign producers is the question of packing, as to which there is a general consensus of opinion that our (England's) foreign competitors, and in particular perhaps the United States, take much more trouble than we do. The following instance is cited: HongKong—candles. British makers absolutely decline to alter their system of packing to that adopted by Continental markets; consequently, they have lost the whole trade. The personal factors which enter into successful competition must not be ignored. It is important that our manufacturers of textile fabrics should know what are the desires or prejudices of purchasers in the different markets of the world, as regards quality, weight, sizing, dressing, and the finish which will often sell low priced goods; preferred lengths and widths, and the manner of putting up and packing, freight charges, etc. An unfortunate trade mark will often doom an otherwise desirable product to failure. This is particularly true in China."

Mr. Gardner, English consul at Amoy, says: "It has not unfrequently occurred that the sale of foreign goods has been greatly crippled by having some label placed upon it that was offensive to Chinese superstition or tastes. Many colors have peculiar recognition by the people; some offend their tastes and others their superstitions. Some are all right on some kinds of goods and all wrong on others. The Chinese will often buy biscuits, needles, thread, matches, soap, medicine, scent, sweets, etc., for the sake of getting a lucky label. Some colors and combinations of colors are to the Chinese unlucky." The same gentleman has furnished his government with some four hundred designs for trademarks and labels which, in his judgment, would be popular with the Chinese people. I have no means of knowing what he has furnished, but from my own observation of what is displayed in shops and what is manifestly pleasing to the people, I give herewith a few specimens of things most frequently seen, and which I therefore think must be popular.

Simply naming these things will not supply sufficient data from which to prepare them. It must be remembered that Chinese art is very peculiar, and a tiger, as ordinarily represented by foreign artists, would not meet with favor with these people. It must be a tiger according to Chinese imagination and art, of unreasonable length of body or bigness of head or curve of tail, and impossible attitudes. On a popular Japanese match box is displayed a monkey standing on its front feet, head nearly touching the ground, with hind feet up in the air, and tail whipping the skies. The grotesque and even hideous, to the American mind, tickles the fancy of the dwellers in Far Cathay. No description can supply adequate information to an engraver or colorer by which he could produce the real thing, and any departure from the Chinese fancy in such things would brand the goods at once as the product of a "foreign devil" and doom it to defeat.

A Chinese dragon differs from a Japanese dragon in its contortions. A royal dragon must have five claws, while the plebeian beast has only four. A stork must always stand on one leg or, flying, must present an enormous spread of wings and trailing long legs. All Japanese birds, when flying, must have a tendency downward, never up or on a straight course. To a Japanese, nothing is preferable to the representation of snow-capped, sacred Fusiyama, as seen on nearly all Japanese fans, screens, etc.

The following are some of the labels, trade marks, etc., which would be useful in the trade of the Far East:

Animals.—Lion, tiger, deer, fawn, leopard, ape, elephant, camel, dragon, buffalo, man plowing with water buffalo, boy riding water buffalo, woman in bright robes holding a long-necked vase on her shoulder while on one side of her is a monkey holding a chrysanthemum in its mouth. Many of these animals are represented in various attitudes—leaping, running, standing on hind legs; some with enormous heads out of all proportion to the body, while some have a long body out of all proportion to the other parts.

Trees.—Banyan, fir, pine, olive, palm, fern, yucca, cactus, tea plant, tea field, orange, banana, pineapple, etc.

Fish.—Dolphin, double dolphin, reversed, carp, double carp, crab, lobster, etc.

Birds.—Pheasant, peacock, paddy bird, stork, cormorant, duck, goose, cock, generally represented flying.

Flowers.—Chrysanthemum, sunflower, lily, rose, twining vines, jessamine, wisteria, etc.

Objects.—Women, archer, trident spear, umbrella, fans (open and shut), open fans with quotations from the classics written on them, long fans (oblong, square and round, all having figures of flowers, animals, birds or butterflies painted on them), houses, temples, books, arches, coolies carrying chests of tea or other articles suspended from ends of bamboo, soldier, flags, banner, ships, junks, sampans, battleship, men fishing with cormorants, tobacco pipe, opium pipe, abacus or Chinese calculating machine, dragons, a long dragon lantern borne aloft on poles by eight or ten men, kites of many shapes, men flying kites, men playing with shuttlecock with feet, wedding chair, wedding procession, lanterns in scores of different shapes, Chinese hats with different colored buttons, mountains, rivers, bridges of granite slabs with high, sharp, arch, and canal boats in canal.

Geometrical figures.—Square, triangle, circle, octagon, square inclosing circle, triangle or octagon and vice versa, a circle with triangles pendent, circle with triangles above and below, large octagon inclosing two smaller ones with figures between the lines and circle in the center and other combinations of figures, Chinese characters for good luck, happiness, longevity, health, prosperity, double happiness; checkered figures, stripes in bright yellow, green, blue and red.

Fruit.—Pear, orange, pumalo, banana, grapes, lichee, mango, pineapple, arbutus, persimmon.

Insects.—Caterpillar, dragonfly, cricket, butterflies of many shapes and colors.

Illustrations of all these things could be obtained at a small expense and could be supplied by consuls in different parts of the Chinese empire.

GOLD JUBILEE IN CALIFORNIA.

Preparations are being made for a celebration at San Francisco of the fiftieth anniversary of the discovery of gold in California. Beginning on Monday, January 24, the whole week will be devoted to the entertainment of the vast crowds that will be present. The citizens and merchants have already contributed $50,000, and more will be forthcoming if required, and the citizens of the State will contribute as much more, besides expending large sums in exhibiting in the most liberal manner the splendid mineral resources from each of the several counties. One of the legacies surviving the former occupants of the State is a fondness for public shows, and in this instance the whole State unites in celebrating in the most extraordinary manner an event fraught with the most wonderful results to the whole world.

Fifty years ago Capt. Marshal found the first gold nugget in Eldorado County. Gold had been discovered previously in San Diego County by the mission fathers, who suppressed the fact, owing to the dread of the consequences upon their Indian wards by the influx of adventurers, sure to be attracted by such an announcement.

For the fifty years ending January 1, 1897, California has produced $1,303,571,598 of gold. In this short space of time the world has been enriched by this amount from one State alone. What the consequences have been by the addition of this store of wealth is a matter of history. In no such brief period has civilization, material prosperity to the masses or inventive genius been so stimulated or advanced with an equal degree of rapidity as in this one, and California throbs with pride in the consciousness that out of her exhaustless resources this magic result has been accomplished.

All classes of citizens, from the Chinese to the aborigine, will unite in the celebration of the event. The former by processions of dragons, and the latter by displays recalling the habits of past generations. Floats representing the progress of the State from Cabrillo and Drake to the present will appear in grand procession, while the government will thunder its salutes from the quaint 16-inch guns at the Presidio, with all those from the surrounding forts of the bay, together with the guns from every ironclad and cruiser that can be concentrated in the harbor of San Francisco. Plans have been laid for an illumination with colored fires of each island in the bay and on every one of the hundred peaks that are visible from the peninsula, promising a spectacle seldom exceeded in splendor. The whole country west of the Rocky Mountains will be in San Francisco on this "jubilee" week. At least 500,000 persons will be present, the large majority of whom will be more or less directly interested in mining.

The most impressive fact of this celebration will be a display of mining resources of the State and the machinery for extracting its mineral wealth. A very large appropriation has been made for this purpose. The Mechanics' Pavilion, the largest building in the State and fitted up with motive power and shafting, has been engaged, and all the manufacturers of mining machinery in the West are preparing to compete for the distinction of making the most creditable display.

The agents of Eastern manufacturers are united in an effort to demonstrate the superiority of their fabrications, and the result cannot fail to be the most splendid display of invention and ingenuity expended in perfecting mining processes that was ever known. The opportunity will be given of comparing present processes with those employed half a century before.

The pitiful resources of the miner of '49, by which so great wealth was extracted from the soil, with the wonderful mechanical devices of the present, will be shown side by side.

THE FRUIT CURE.

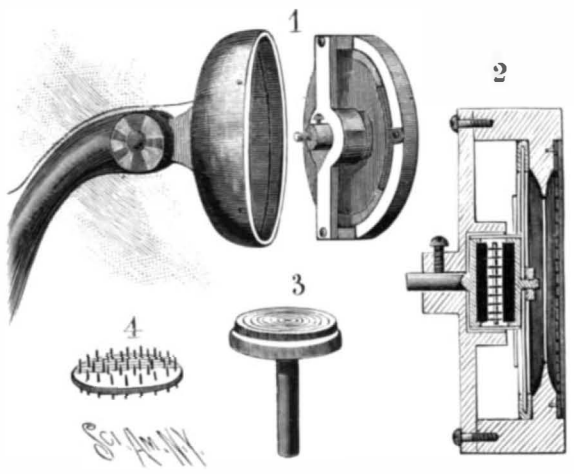
The so-called "fruit cure," although not much heard of in England, says Nature, is well recognized at various places on the Continent, where so-called grape cure stations have been established. In a recent number of Modern Medicine and Bacteriological Review there is an interesting article on the subject, in which the historical side of the question is dealt with. Thus we are told that many medical authorities in the tenth century became enthusiastic in their writings over the remarkable curative virtues of grapes, while a certain Van Swieten, of a more modern date, is said to have "recommended in special cases the eating of twenty pounds of strawberries a day." The same gentleman also reports a case of phthisis healed by strawberries, and cites cases in which maniacs have regained their reason by the exclusive use of cherries as food! These instances rather savor of the miraculous; but there is no doubt that the so-called grape cure, for indigestion and other evils, is carried on in many places on the Continent, and that people betake themselves to Meran, Vevey, Bingen, or to Italy and the south of France with the intention of devoting six weeks to the cure, during which time they are expected to have gradually accomplished the feat of consuming from three to eight pounds of grapes daily, as the case may be. Grapes are said to exercise a salutary action on the nervous system and to favor the formation of fat, that is to say, when fruit of good quality is employed; if the grapes are not sufficiently ripe, and are watery and sour, the patient may lose rather than gain in weight. Dr. Kellogg, director of the Sanitarium Hospital and Laboratory of Hygiene at Battle Creek, Mich., is of opinion that the valuable results obtained by a fruit diet in cases of biliousness which he has observed are due to the fact that noxious germs habitually present in the alimentary canal do not thrive in fruit juices.

A HUMANE RAT TRAP.

A recently issued patent in the way of traps for rats, mice, etc., duly mentioned in another column, seems to us worthy of some additional notice. The inventor describes ordinary traps as "at best inhuman and cruel, as they kill the animal more or less quickly, subjecting it to torture arising from its imprisonment, as well as the possibly much greater torture arising from the contemplation of its impending fate," and adds that "these animals soon become very shrewd, it often happening that after a few have been caught and killed the others become so knowing that it is impossible to tempt them into traps with any kind of bait." As a more humane and efficient method of ridding a house of these pests the inventor provides a trap which, as the rat goes into its wide open entrance, will spring upon the body of the rat an elastic band to which are attached bells and bunches or tufts of cotton or other material, painted or coated with phosphorescent paint. The rat, it is claimed, will then "immediately run away, with the bells tinkling and the plumes waving, so frightened that he will make a tour of all his holes and runways, meeting all his brethren and frightening them by the sound of the bells, the phosphorescent tufts, and his fantastic appearance." It would not be strange if "this being kept up for a short time would drive all the rats away."

AN IMPROVED TELEPHONE TRANSMITTER.

In the novel form of transmitter shown in the accompanying illustration it is provided that granulated German silver may be held between the carbon buttons, or that there may be an intermediate disk with pins projecting from its faces to engage the faces of the buttons, the distance between the buttons being readily increased or diminished, according to the intended use and surroundings of the instrument. The invention has been patented by James H. Spencer and Malcolm S. Keyes, and the transmitter is being manufactured by the Spencer Electric Company, No. 163 Greenwich Street, New York City. Fig. 1 shows the application



THE SPENCER-KEYES TELEPHONE TRANSMITTER.

of the improvement, Fig. 2 representing a cross section, Fig. 3 the adjustable button, and Fig. 4 the intermediate disk with projecting pins. Opposite the carbon button on the rear face of the diaphragm is a similar button fitted into a cap and having a stem sliding longitudinally in a bearing on a bar secured to lugs projecting from the casing, the stem and second button being held in adjusted position by a set screw. The opposing faces of the buttons are roughened and have concentric grooves to insure a large contacting surface for a transmitting device held loosely between them, and preferably consisting of a disk of cork from the faces of which project German silver pins, although instead of the disk and pins loose granulated carbon or granulated German silver may be used. To prevent the loose transmitting device from working out between the buttons, the latter are inclosed by a flexible wrapper, in which are openings, that the wrapper may offer but slight resistance to the vibrations of the buttons.

The Submarine Cable.

The submarine cable is now one of the leading factors in international communication, says The Age of Steel. At its inception it met with failures, commercial or otherwise, but as methods of construction and laying improved, its earlier risks were largely averted. It now trails along the mud and sand of the seas, dangles its huge loops on submarine precipices and across their dark chasms, and along the gloomiest caverns of every ocean the silent messages of commerce, friendship, diplomacy and of governments make their lightning race around the planet. The laying of the first Atlantic cable was the initial of a supreme effort to unite the family of nations. It was costly, and in a commercial sense, up to a certain date, a failure, but as a triumph of engineering science it marked an epoch in international communication. Other cables had somewhat of a dismal beginning, but enterprise did not stop at disasters, nor did the engineer halt at what, after all, was but temporary obstruction. The good work continued and has reached such massive proportions that a navy of forty-one telegraph ships, fully equipped and manned, is distributed over the oceans of the world, representing a gross tonnage of 60,000 tons. The manufacture of cables represents huge investments of capital and an army of workers. Great Britain has so far led the way in this modern industry, and was for a time as supreme at the bottom as at the top of the sea. The honors are now being divided by France, Italy and Germany. Manufacture is no longer an exclusive monopoly. New cables will continue to be laid, and as time, corrosion, accidents, submarine convulsions and the encroachments of marine shell fish and monsters cause breakages and loss, the supervision of repairs will be a permanent occupation both to experts and seamen. The following table shows the mileage and number of cables now in use:

Cables under	5 miles in length			761
Exceeding	5	miles and under	50	223
Exceeding	50	"	100	65
Exceeding	100	"	500	155
Exceeding	500	"	1000	64
Exceeding	1000	"	2000	29
Exceeding	2000	"		8
Total				1305

The expenditure of money in the laying and manufacture of these submarine lines has been roughly estimated at $200,000,000. These are big figures, but they will be larger as the network of wire spreads on ocean bottoms.

METEOROLOGICAL KITES IN FRANCE.

For some time past, at the Observatory of Dynamic Meteorology, experiments have been in progress with kites carrying meteorological registering apparatus analogous to those employed at Blue Hill (United States), under the direction of Mr. L. Roth. Quite recently there has been detected a curious distribution of temperature in the vertical. In fact, on the 2d of November, the temperature, which was 7° at two o'clock at the Observatory of Trappes, fell progressively to 3° at an altitude of 450 meters and afterward rose to a little above 10° at an altitude of 1,200 meters. This distribution of temperature kept up during the entire night. An accidental circumstance having obliged the experimenters to leave the kites in the air until the following morning, that is to say, for eighteen consecutive hours, they descended more than 600 meters.

Each of such descents was accompanied with a drop in the temperature of more than one degree per 115 meters. In the middle of the night, at a few minutes' interval, the temperature was 8° at 1,000 and —1° at 120 meters. Such inversions of temperature are very often observed between mountain stations and stations on plains, but they usually coincide either with the different directions of the wind at two heights or with calm weather in the lower station, which permits the cold air to accumulate near the earth. In the case under consideration, nothing of the kind occurred. The map of the international bulletin for the morning of the third shows in Europe a very marked maximum of barometric pressure which gave rise to pretty strong east winds. The velocity of the wind at Trappes kept up to more than 5 meters during the whole night between the 2d and 3d of November.

The wind in the warm station reached by the kites was E. N., differing little from the lower wind, which blew from the N. N. E.

In Fig. 2 we reproduce a portion of the curve traced by the registering apparatus during a period in which, the heights of the kite having been made to vary, there were obtained two sections of the distribution of the temperature in the vertical. This example shows, once again, all the benefit that can be derived from the use of kites in the exploration of the atmosphere.

By providing the kites with a special registering apparatus of great precision (like the one represented in Fig. 1), that permits of obtaining the pressure within a fraction of a millimeter and the temperature within about a third of a degree, and by taking care to determine the position of the registering apparatus by sights taken from two stations separated by a proper base, it is possible to determine the difference between the height of the registering apparatus deduced from the barometric pressure and the absolute altitude determined by triangulation. Such difference, brought to the unit of height, is what is called the vertical barometric gradient, the existence of which was proved for the first time by the researches of M. Teisserenc de Bort upon the variation of pressure, first at mountain stations and later at the Eiffel Tower.

In order to calculate the barometric gradient, we compare the difference of barometric pressure, observed for a given height, with that which should have existed if the air had been in equilibrium and which is given us by the formula of Laplace. This formula does not express an empirical law, but is derived from the law of Mariotte, and its coefficients are known with great precision.

On the subject of the vertical gradient, we shall confine ourselves to recalling the principal facts that are revealed to us by the discussion of the observations on Puy de Dome, Ventaux and the Eiffel Tower.

1. Almost every day there exists, between the decrease of pressure in the vertical that corresponds to the state of equilibrium and the decrease observed, a difference that is now positive and now negative. Such differences, at least on the low strata, present a somewhat marked diurnal variation. The pressure decreases more quickly between 8 o'clock in the morning and 8 o'clock in the evening and more slowly during the night.

2. At the moment of the passage of the barometric depressions the decrease in pressure is more rapid than the law of equilibrium indicates (particularly in the anterior portion of the depression); but, on the contrary, the pressure decreases more slowly in the areas of high pressures.

The vertical gradient depends especially upon the horizontal movements of the air and upon the centrifugal effects that are the consequence of gyratory movements, and, finally, upon a series of effects due to the viscosity of the air and to the undulating motions of which the atmosphere is the seat. It is, therefore, a very complex phenomenon, which demands a minute analysis. In order to calculate accurately the vertical gradient, it is indispensable to know the temperature of the air and its humidity between the earth and the point of observation. This is why the kite is well adapted for use, it permitting of obtaining determinations of such elements at the same place at various heights. The accompanying curves furnish an example

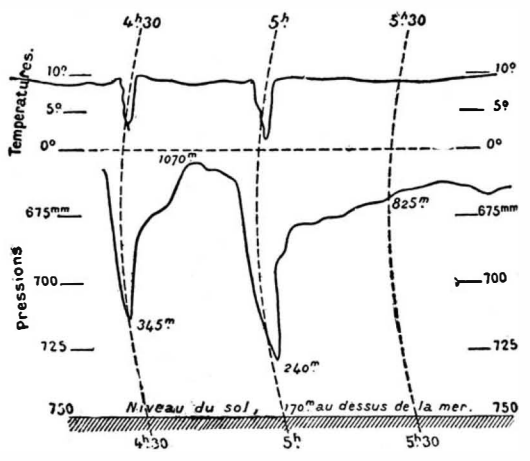


Fig. 2.—TEMPERATURE AND PRESSURES INDICATED BY A REGISTERING APPARATUS CARRIED BY A KITE.

of this. For the observation of the temperature at 1,100 meters and at the earth, it was impossible to foresee the variation of the temperature that occurs between 500 and 1,000 meters and that lowers by two degrees the mean temperature of the total stratum of the air considered—the effect of which would be, if account were not taken of it, to introduce large errors into the calculation of the gradient.

The numbers collected by these sections of the atmosphere are much more accurate than those that can be deduced from stations situated at different heights along a mountain where the influence of the earth is very marked. For researches that demand great precision, we have, therefore, in the use of the kite a very satisfactory method for studying the state of the atmosphere when it is absolutely free in its motion.—La Nature.

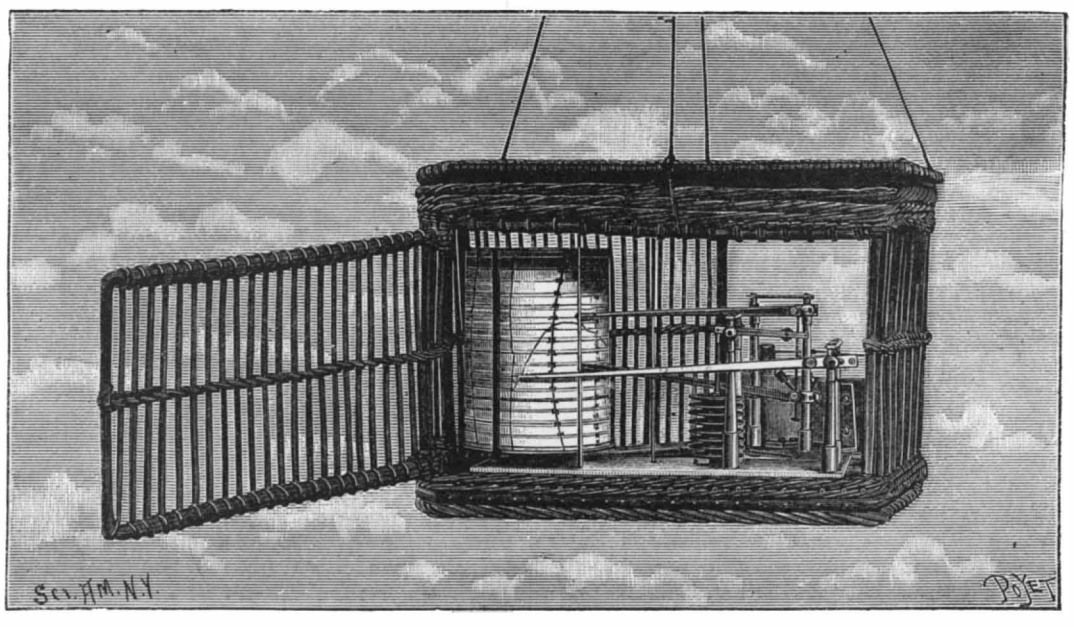
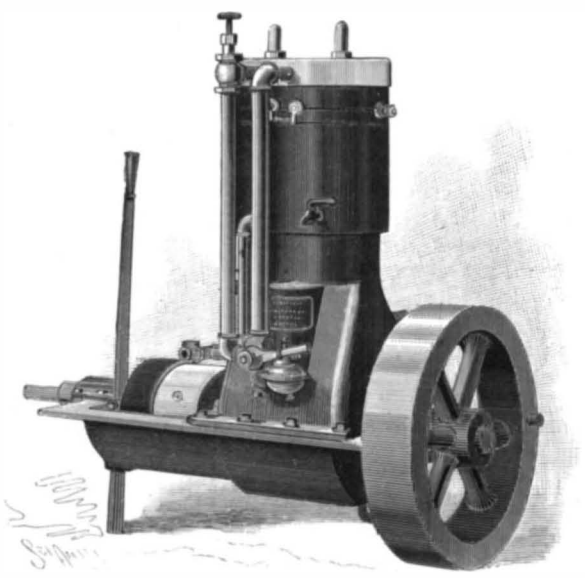


Fig. 1.—ALUMINUM REGISTERING APPARATUS FOR STUDYING THE VERTICAL GRADIENT.

ROMANIUM is the name given to a new alloy of aluminum with tungsten and nickel. The alloy is comparatively light and resists acid action well. It has the consistency of a good manganese bronze. It is extremely malleable. Aluminum forms 94 to 95 per cent of the alloy.—Monatschrift für den Oeffentlichen Baudienst.

THE KING GASOLINE LAUNCH ENGINE.

The simple, compact, quiet running engine shown in the accompanying illustration is manufactured by the Charles B. King Company, of Detroit, Mich., the type having been adopted and its principal features developed as a result of extended experience with gasoline motors. The impulse is given at every second revolution only in each cylinder, whereby the products of combustion are expelled by the return stroke of the

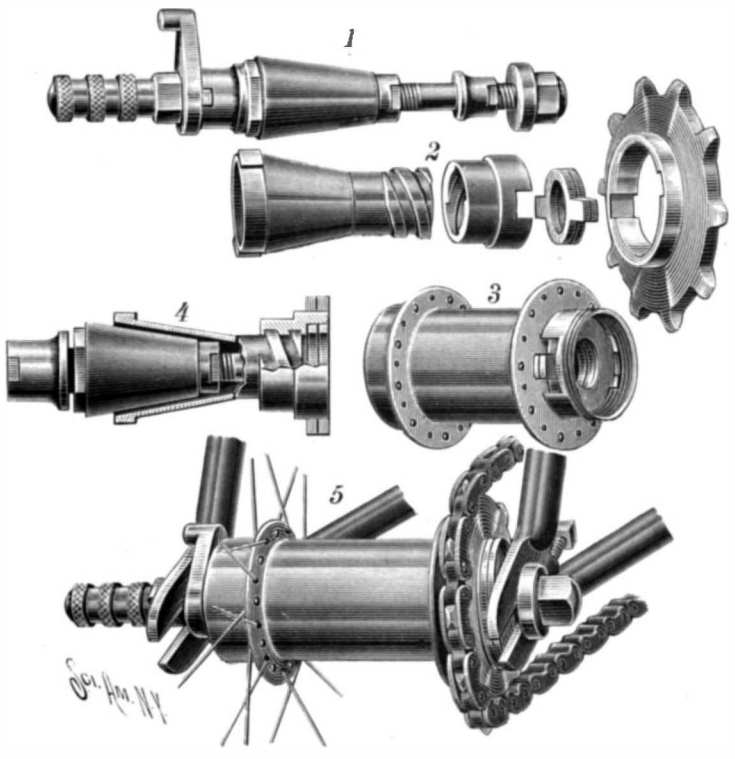


THE KING GASOLINE LAUNCH ENGINE.

piston, the exhaust being rendered perfectly silent by passing out under the water, and the incoming charge is received into a clean space where no burnt products remain. This arrangement increases the effectiveness of the explosion and enlarges the range of the mixture, the engine being also more positive in its action and not requiring the careful adjustment necessary with many other types. The flywheel is easily turned by pulling out the relief rod, two slow revolutions being enough to start the engine, and no hand crank being required. The electric igniters will last as long as the engine and do not require care or attention. The use of oil cups is entirely dispensed with, all the working parts, cylinders included, being copiously oiled by the dashing of the cranks through the oil in the crank case, the oil used being "crank case oil," costing fifteen cents per gallon. An outside supply chamber indicates the oil level and shows when it is necessary to replenish the supply. The reversing gear is made a part of the engine, and the use of a propeller with reversible blades is avoided. The engine shown in the illustration is rated at 6 horse power, but is said to develop 7½ horse power, its weight being 700 pounds. The King exhibition launch, running on the Detroit River, affords a good exemplification of the capabilities of these engines. The launch is 33 feet long and has a speed of 10·6 miles per hour.

AN IMPROVED BICYCLE BRAKE.

The accompanying illustration represents in detail the principal parts of an improved bicycle brake manufactured by the Hay & Willits Manufacturing Company, of Indianapolis, Ind., Fig. 5 showing the complete device as applied, from which it will be seen that the brake mechanism is entirely within the hub. Fig. 1 shows the axle with its friction cone of vulcanized fiber and Fig. 2 the steel sleeve or socket in which the cone is inserted inside the hub casing, the thread at one end indicating the manner in which the cone is brought to a friction bearing by means of its keyed connection with the sprocket, as further shown in the broken-away portion of Fig. 4. Fig. 3 represents the hub casing, inclosing the bearings completely and protecting all parts from dust. The brake is applied by a slight back pressure on the pedals, causing a limited reverse movement of perhaps one-sixth of a revolution on the rear sprocket. There are, as will be seen, no springs of any kind in the device, the brake action being entirely controlled by the pedals, leaving the rider free to use his hands to control his machine, and when the brake is applied at the top of a hill the rider may coast in the usual way, the brake not being released until a forward pressure is exerted upon the pedals. The wheel is checked slowly or rapidly, according to the amount of pressure used in back pedaling, and the brake is released by the application of the same amount of power by pedaling in a forward direction, and, of course, a stop can be made as readily on a slippery or asphalt road as on a dry pavement. The brake is not visible on a wheel, except as its presence may be indicated by a slight enlargement of the rear hub, and thus in no way detracts from the appearance of the machine.



THE WILLITS AUTOMATIC REAR HUB BICYCLE BRAKE.

Rich Alaskan Islands.

Large ledges of copper and gold ore have lately been uncovered on Gravina, Annette and Revillagigedo Islands, on the southeastern Alaska coast. Prospectors declare that these, together with Mary and Prince of Wales Island, contain mountains of rich ore that will make their ultimate possessors immensely wealthy. Many claims have been located on Gravina, and prospectors are rushing in from Puget Sound. The Wragel and Juneau ledges are ten to fifty feet wide, rising frequently above the level of the ground, making their development very easy. Where the work of development has been begun, the value of the ore has increased beneath the surface.

Solis Cohen, who has just returned from the islands, says The New York Times, declares that hundreds of thousands of tons can be milled or shipped to smelters without sinking shafts. Not only do the ledges extend from tidewater to the mountains in the interior, but they are also found beneath salt water. Some of these have been blasted open at low water and found very rich in gold. The islands have good harbors, where ships can call for cargoes of ore, as well as numerous mill sites and waterfalls from which power may be obtained for operating stamp mills.

The immediate opening of mines rivaling or exceling those about Juneau is expected on these islands. Gravina, the richest, lies along Nicholas Passage and Tongas Narrows, extending from four miles opposite New Metlakahtea to sixteen miles above Ketchikan.

Trolley on the Canals.

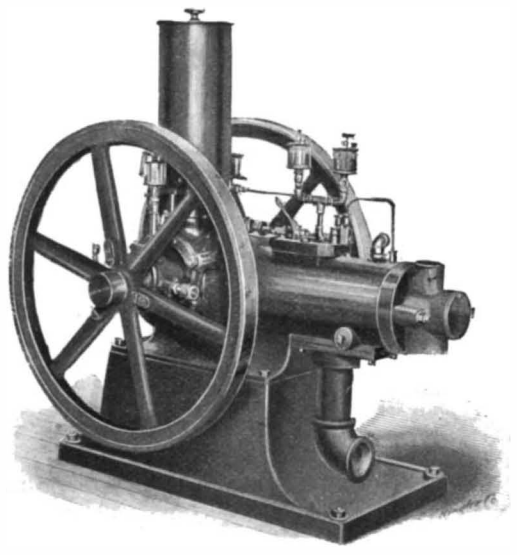
A meeting of the Cataract General Electric Company was held January 10, to consider the beginning of work under the company's charter, which permits the establishment and operation of an electric motive system along the State canals for the supplying of power to boatmen. The company has had an engineer prepare plans and specifications for the installation of an electric cableway for sixty miles along the Champlain Canal, from Whitehall to West Troy. The charter was granted several years ago, but if it is decided to carry out the plan submitted for the Champlain Canal, that will be the first work the company has undertaken to do. The cableway system proposed, it is understood, is an alongshore trolley, from which power will be supplied to motors that will haul the boats. If the proposed plan is accepted, the details of operation will probably be publicly explained. If it is a success, the problem of canal transportation is likely to be settled for some time to come.

The Current Number of the Supplement.

The current number of the SUPPLEMENT, No. 1151, contains the conclusion of Prof. Octave Chanute's "Gliding Experiments." This is one of the most important papers on the subject of aerial navigation which has been published in a long time. Like the former papers, it is illustrated by engravings made from instantaneous photographs showing the apparatus in all stages of operation. There are ten engravings in the present number. There is also an article on the "Modern Distillation of Wood for the Production of Acetic Acid, Wood Spirit and Acetone in the Pure Form." Literature upon the distillation of wood is limited. There is also an illustrated review of Prof. Lanciani's "Ruins and Excavations of Ancient Rome," and a paper by Mr. Penrose, "The Orientation of Greek Temples," and the number is concluded by a lecture by Prof. Rufus M. Jones on "Telepathy."

AN IMPROVED KEROSENE ENGINE.

The illustration represents a simple, safe and reliable engine, for which patents have been recently granted in the United States and several European countries. It is the invention of Carl W. Weiss, and is manufactured by August Mietz, of No. 87 Elizabeth Street, New York City. The basis of the explosive charge is supplied in liquid form, to be vaporized and mixed with the proper proportion of air in the engine, and a primary feature of the invention has been to produce an engine in which the fouling and clogging of the working parts so common in engines of this class shall be largely reduced, the entire construction, also, being exceedingly simple. A closed oil tank of a capacity of ten hours' run is screwed to the engine cylinder above the crank chamber, and from this tank, through a small copper tube, the kerosene is forced into the cylinder and then vaporized and mixed with the proper quantity of air, the speed being kept uniform under different loads by varying the number of kerosene injections, which is effected by means of a simple governor in connection with an eccentric on the main shaft, the quantity of each injection, however, remaining constant. In engines above ten horse power a variable charge governor is used. The water-jacketed working cylinder has an unjacketed explosive chamber in which the



THE MIETZ & WEISS KEROSENE ENGINE.

temperature is always so high that the engine is self-igniting after it has been started, the oil as it is fed from the nipple being caught by a blast of air entering from the compressor and blown in the form of spray against the heated surfaces, by which it is vaporized, at the same time that the necessary volume of air is furnished to form the explosive mixture. In running at full power, the explosion and impulse occur at each turn of the crank shaft, the cutting out of an injection by the governor, and consequent omission of an explosion, constituting a method of governing by which the consumption of oil is proportioned to the actual power developed by the engine. It is estimated that with kerosene at seven cents per gallon, this engine may be run at an average cost of ¾ cent per horse power per hour. It is silent and smooth running, and the inclosure of the crank shaft, and the absence of all gears, cams and shafts, obviate danger to inexperienced attendants. The engine is free from the smell usually so objectionable a feature of oil engines, and all the working parts are protected from dirt and dust.

Weather News by Trolley Car.

The distribution of news by means of the now ubiquitous trolley cars has already been attempted in various ways, and chiefly in the line of advertising, outside the car as well as inside. In some cases, enterprising stores have mounted their notices on the trolley poles, like sails or pennants. The idea has also been successfully carried out by putting little flags or signs on cars when the circus is in town or when the ice will bear in the parks. In some places the cars in bad winter weather have carried signals notifying public school children as to whether school will be open or not. Of somewhat the same nature is the plan now being carried out on the Akron, Bedford and Cleveland suburban trolley line of displaying weather signals, says The Electrical Engineer The plan is for the local weather bureau to notify the road of the successive and prospective meteorological changes, and for the cars as they go out to mount the appropriate signal in the shape of a tin flag symbol. Steam railroads have already tried this useful plan, and it is evident that the trolley cars can be even more efficient as distributers of such news quickly over large local areas. Cars running out into rural districts will be specially serviceable in this way.

Home-made Fancy Cheese.

The extensive use of imported fancy cheeses in this country is partly offset by our exports of common American cream cheese. It is one of the strange facts of commerce that we send thousands of tons of cheese abroad to England, France, Germany and South America, and from these same countries import Limburger, Edam, Stilton, Roquefort, Brie, Camembert, Swiss and Neufchatel. We receive for our export cheese only nine to ten cents a pound, and pay our transatlantic cousins from thirty cents to one dollar a pound for their fancy dairy products.

In spite of our larger shipments, this difference in the price makes the balance of trade go against us, especially when we consider the comparative amount of raw material used in each. The milk and cream used for the foreign fancy cheeses are not superior to that raised in this country, in fact not so good; and it is not to be supposed that the Swiss or French dairymen can keep their cows cheaper than farmers can in this country, where sweet, succulent grass is as free as the air we breathe. The whole difference in the export trade in cheese is in the manufacture. With our natural impatience and desire to get quick returns for our labor, we seem unwilling to cure our cheeses properly, and we send common American cheese abroad for the poorer classes of Europe and South America, and receive the fancy cheeses of the foreign makers at a much higher price.

Until quite recently it was supposed that the fancy Swiss and French cheeses could be made only in the caves and peculiar climate of those countries; but experiments in this country have demonstrated that we can make these fancy products almost as well as the foreigners, and instead of paying half a dollar per pound for them, we can manufacture them at home for one-half. Nearly all of the desirable cheeses are made here now in a limited way, and we are beginning to make considerable headway in supplanting the foreign article by our own products. It requires time, patience and skill to make these fancy cheeses; but any one who is willing to pay this in exchange can have the desired results. In the present stage of the new industry it is possible that better success can be obtained in a small way where the fancy cheeses are made at home for table use. Any woman fond of these luxuries can manufacture a sufficient quantity at small cost to keep the table well supplied. The fancy cheeses can be made in the country or in the city, provided good milk and cream can be secured.

Roquefort cheese is one of the most popular of the foreign fancy cheeses, and it sells for half a dollar a pound in this country; but it is only a half-skim cheese that is easily made. The milk is first heated nearly to the boiling point, which destroys all undesirable germs in it, and then allowed to stand until the cream rises. In France part of this cream is then removed and made into butter, while the cheese is made of the remainder. Then the milk is heated again, and one tablespoonful of rennet is added to every one hundred and twenty pounds of milk. When part of the whey is drawn off, the cheese is sown with the needed germs. These are obtained by making a cake of barley meal and putting it away in a damp place until it is covered with a blue mould. When thick with these foreign germs, the cake is crumbled up and mixed with the curd as it is put into the moulds. The cheese is turned twice a day in the moulds, so that some of the whey is retained and not allowed to drip off. This whey is gradually absorbed by the cheese and with it some of the rennet. The cheese is kept in the mould in this way, protected from the air, for three days, and it is only opened occasionally for the purpose of turning it and sprinkling it with warm water. The warm water hastens the growth of the germs and ripens it. At the end of three days the Roquefort is exposed to a cool, dry air, preferably on the north side of the house. This cool atmosphere checks the growth of the barley-cake germs and dries out the moisture. The cheese may be wrapped in dry cloths to hasten the drying-out process.

In France the Roquefort cheese is removed to the limestone caves under the ancient town of Roquefort, where it is allowed to ripen and cure. Similar atmosphere to these caves can be provided in a cool, dry cellar. All light should be excluded, and a draught of cool air should be allowed to blow continually on the cheeses. The temperature must be kept as even as possible. While thus curing it should be sprinkled with salt frequently, and then when a gelatinous substance forms on the surface it should be scraped off with a knife. In time red, yellow and blue moulds will appear on the cheese. These must be scraped off in turn, and then the cheese is ready for eating.

English Stilton cheese is the most famous variety produced in England, and it is highly prized in this country as a fancy and luxurious relish. It somewhat resembles the Gorgonzola of Italy, the leading blue-moulded cheese of the world. The method of making the English Stilton is as follows: The morning's milk is set at a temperature of 85 degrees, and at the end of an hour the curd is removed in thin layers. The curd is placed into drainers prepared for this purpose, layer upon layer, and as it gets warmer it gradually parts with its whey. The corners of the cloth drainers are brought together and slight pressure is gradually placed upon the curd to make it part with its whey more effectually. The curd should be hung up in the drainers over night in a temperature of about 30 degrees. On the following morning it should be removed and cut up in small cubes and placed on tins to air. By coming in contact with the oxygen of the air the acidity of the curd is increased. On the second day the curd is ripe enough to mould. A similar curd is made from the milk and cream obtained fresh the second day, and these two are then mixed together in the mould. The mould is any vessel perforated with rather large holes through which the whey can drip. The first curd is distinctly acid, and when the two are broken up and mixed together they start germs to working that gives a peculiar flavor to the cheese. The cheese should be salted to suit the taste at this stage, and then the mixture should be moulded into the shape desired. In three or four days it will be firm enough to stand alone out of the mould if the temperature is kept at about 60 degrees. Then it is wrapped firmly in calico or cheese-cloth and put away to dry and ripen. The ripening process can be hastened by increasing the temperature of the drying room from 65 to 67 degrees. It may take several days or a week to make the cheese perfect, but all cheese cured in this manner improves with age if kept in the right temperature. This is one of the chief virtues of the fancy cheeses; they do not deteriorate with age, but rather increase in value up to a certain point. Ripening can be delayed and almost stopped by reducing the temperature, as the bacteria will not work and develop in a low temperature.

Gorgonzola cheese, of Italy, commands the love of every native of that sunny land, and it ranks high in most other countries. This famous blue-moulded cheese is made from the average milk of cows, and it is produced from two curds, similar to the English Stilton. In the case of the Gorgonzola, when the two curds are mixed together one is cold and the other warm and fresh. The milk of one day is brought to a temperature of 80 to 85 degrees and then the rennet is added. The rennet is put into a piece of cloth and then squeezed through it into the milk, where it is subsequently thoroughly stirred. When the curd is fit for breaking it is cut into very small pieces, and these are gathered up into a cloth and hung on a beam overnight for the whey to drip out. The temperature of the apartment should be kept between 60 and 65 degrees. The following morning the fresh milk from the cows is treated in the same way. The new curd thus formed will be warm, sweet and moist, while the curd of the previous day will be cold, dry and slightly acid. Any kind of a deep mould of wood or metal can be used. First a layer of the fresh, warm curd lines the bottom of the mould; then a layer of the previous day's curd is pressed over it, and so on alternately until the mould is full. The only thing to be sure of is that a layer of the fresh, warm curd covers the entire surface of the cheese. These two curds act and react upon each other.

In two days the surface of the cheese is then thoroughly salted with very fine salt. This salting continues daily from two to four weeks, the operator rubbing the salt in the sides thoroughly. If the blue mould does not then appear upon the cheese, it is pierced with metal skewers, which admit the air. In Italy the Gorgonzola cheese is taken to the caves to ripen, at this point; but nearly as good results can be obtained in a dark, cool cellar kept at a temperature of 55 degrees. It takes from four to five months for this cheese to ripen. During this time it will have in turn a dark fungus mould on its surface, a dull red and a blue mould.

Géromé, or Gérardmer, cheese is one of the best imported cheeses, selling in Europe as high as twenty-five cents a pound. It is made chiefly in the mountains of the Vosges, in eastern France, a part of the territory which was taken with Alsace from the French by the Germans. The fresh milk from the cows is drained as soon as obtained and at once curdled. Two tablespoonfuls of well-digested rennet are put into fifty quarts of milk. The milk is kept covered for half an hour after the rennet is added. Then the curd is ready for cutting to separate the whey. When the two have separated, the curd is dipped out and put into a wooden mould, made in two parts, one fitting into the other. The lower half is perforated with holes so the whey can drain off. In twelve hours the upper one is removed and a new one put in its place and the whole reversed. In this way the whey is completely drained and dried off. The temperature during this process should be maintained at 60 degrees. Then the surface of the cheese is salted every fourth day. The cheese is turned several times each day and dipped in water and wiped off with a dry cloth. When the cheese is dry enough so that the sweat no longer appears on its sides it is removed to the drying room. They are dried in open-air boxes with a cloth thrown over them to keep out the dust and flies. Then they are taken to dark, cool cellars, where they are cured in from three to four months. If the temperature is too cold for the ripening, the cheese must be washed in warm water occasionally, and if the temperature is too warm, it must be sprinkled with cold water. The whole curing process can be regulated in this way. A little over three quarts of milk make a pound of Géromé cheese.

G. E. W.

The Dangers of Acetylene Gas.

The board of Fire Commissioners of Jersey City has adopted regulations for the manufacture and storage of acetylene gas. The regulations provide: "That the manufacture of carbide of calcium or the liquefaction of calcium carbide be prohibited except under certain prescribed limitations to be designated by the board. That it declines to permit the use of any acetylene gas regenerator in this city except those devices first submitted to the board for careful test, examination, and approval of the board. That after the careful examination made into the methods of operation of the Bournonville gas regenerator, and finding the same to be operated on safe scientific principles, and in view of the small quantity of carbide treated by said device and the careful storage and distribution of the same, that the embargo laid by the board against the use of this machine be withdrawn and its operation sanctioned, provided that the methods now employed be not altered or made more dangerous.

"It is further provided that the use or storage of calcium carbide be confined to quantities of five pounds each, which must be stored in heavy block tin vessels, and until ready for use hermetically sealed, and that no dwelling, factory, or other building be permitted to keep on storage a total quantity in excess of twenty-five pounds in cans or vessels of five pounds each.

"All parties desirous of storing in this city a quantity of calcium carbide or liquefied acetylene gas in excess of the limitations above defined to be allowed to do so only upon formal request to the board and special permission obtained therefrom."

To Rebuild the Naval Academy.

Secretary Long has addressed a long communication to the Senate and House Committees on Naval Affairs, calling attention to the wretched condition of the Naval Academy and asking that an immediate appropriation of $500,000 be made and approval given to a general scheme which he submits for a complete rehabilitation of the school. This plan he submits was drawn by a special board, of which Admiral Matthews and Captain Cooper, superintendent at Annapolis, were members, and contemplates the expenditure of about $6,000,000. Secretary Long says that the essential features of this plan are approved by the department, but that as the finances of the country will not permit of a heavy outlay at once, he asks that provision be made now for three new buildings and other improvements, which can be carried out with a view to continuing the general scheme as money is appropriated.

The secretary asks that provision be made, says The New York Sun, without delay for an armory to cost $300,000, a boathouse to cost $300,000, a power house to cost $100,000, four rows of officers' quarters to cost $60,000, and for grading and electric plants $90,000.

A Locomotive Driving Wheel Bursts.

The rim of one of the big six foot driving wheels of the engine drawing the Royal Blue Line Express for Baltimore and Washington, which left Communipaw at 11:30, January 9, burst as the train was rushing past the Netherwood station at 12:10. The wheel went to pieces and the heavy sections of the rim flew in all directions. Three persons were injured somewhat. The train was making fully fifty-five miles an hour when the accident occurred. It ran more than a mile before it could be stopped, and brought up in front of the station in Plainfield, N. J. One of the sections of the burst driver flew outward and upward and cut a hole in the side of a coal car in a passing coal train. This brought the coal train to a stop and blocked the track the train was on for an hour. Another piece crashed against the side of the combination coach of the express train at the first seat back of the partition. A hole three feet square was torn in the side of the car.

International Fire Insurance Congress and Exposition.

An international fire insurance congress is being organized in Paris. Its president, says L'Argus, will be M. Berthelot, who believes it to be the duty of science to devise and disseminate effective means of forestalling or extinguishing conflagrations. The terrible disaster at the Bazar de la Charité has aroused the scientific world in France and elsewhere to action. Hence great scientific demonstrations may be expected. All inventors are invited to take part, and architects, engineers, builders, mechanics, etc., will vie with each other as regards enterprise and resources.

A special exposition to be held at the Esplanade des Invalides will precede the congress. The enterprise has gained many influential friends in the highest circles. The office is 5 Place de l'Opera, Paris.

Science Notes.

M. Brunetière has retired from the editorship of the Revue des Deux Mondes, which will give satisfaction to scientific circles, as he changed the Revue from a liberal to a clerical organ and had adopted an attitude somewhat hostile to modern science.

The discoverers of quinine and strychnine, MM. Pelletier and Caventou, are to have a monument erected to them in Paris, and contributions are being solicited from pharmacists all over the world to aid in this worthy object. In this country the movement has been taken up by the Philadelphia College of Pharmacy, and Prof. Trimble, the editor of The American Journal of Pharmacy, has issued an appeal for funds in order that the United States may be worthily represented in the undertaking. Pharmacists who contribute to the fund will honor their vocation, says The American Druggist, while honoring the memory of two distinguished pharmacologists. The monument is to take the form of statues which will be erected in front of the High School of Pharmacy, in Paris.

The color of school exercise boards is a matter of great importance, but has been strangely neglected, says The Pharmaceutical Era. For, from time immemorial, it has been a fact of common knowledge, even among uneducated people, that black is the worst of colors for the eyes; hence, it has long been a custom with tailors to charge more for making a black suit of clothes than for any other color. For many years an exchange has given school room hygiene much special study, and taught that school exercise boards should not be black. The best color for such boards is some shade of cream white, a dead surface of soft, mellow tint, varied in its degree of whiteness to suit the quality and quantity of light afforded. The crayons for exercise boards, for ordinary daily use, should be a clear sky-blue color; the extra colors a canary orange and a clear dark green.

The remarkable property which some alloys of nickel and iron possess of having a coefficient of expansion nearly equal to zero suggested the desirability of employing these alloys for the construction of measuring instruments. With this object in view, M. Guillaume, in Comptes Rendus, has determined the densities and moduli of elasticity of a series of alloys of iron with 4 to 45 per cent of nickel. One curious result in the case of alloys with 25 per cent of nickel is that a rule made of this alloy and annealed at a given temperature continues to elongate when it is kept at a lower temperature. He also finds that an alloy containing 22 per cent of nickel expands when it is heated considerably more than ordinary steel, but an alloy of iron with 37 per cent of nickel hardly expands at all, so that the presence of an additional 15 per cent of nickel in nickel-iron alloys is sufficient to entirely change the nature of the metal.—Engineer.

According to a statement in the Revue Scientifique, the chemical adulteration of milk is one of the hygienic factors now to be dealt with. It seems that M. Denigès, of Bordeaux, having obtained possession of three samples of yellow powder used by certain milkmen of Bordeaux to preserve their milk, made a chemical analysis of it. This analysis showed that two of the powders were composed wholly of neutral chromate of potash, that the third was a mixture of one part bichromate of potash and two parts neutral chromate, and that the suspected milk had been adulterated with the last substance in the proportion of 0·30 gramme to the liter, say five grains to the quart. The alkaline chromates are, in fact, powerful antiseptics, capable, even in small quantities, of retarding lactic fermentation very noticeably, if not of stopping it entirely. But because of the deleterious action of these salts on the organism, the Revue calls emphatically for their complete exclusion from food substances, and particularly from milk, of which so many young children drink relatively large quantities.

The suspicion of important astronomical discoveries recently made at the Lowell Observatory, at Flagstaff, Ariz., which has prevailed among men of science for the last few months, was confirmed on November 29, says The New York Tribune. Briefly summarized, the work of the year at Flagstaff includes the discovery of about five hundred new stellar systems, the measuring of some seven hundred systems noticed by previous observers, the careful examination of five thousand stars in the zone between 20 and 65 degrees south declination all brighter than the tenth magnitude; the rotations of Jupiter's third and fourth satellites, resulting in valuable facts; an exhaustive generalization of the stars in space; an investigation, with excellent results, of the phenomenon known as the twinkling of the stars; a generalization of many double stars, etc. There arrived in Boston recently Dr. J. J. See, who is largely responsible for many of the discoveries in the heavens made at the Lowell Observatory. Dr. See has charge of the double-star observations; Mr. Lowell has charge of the planetary experimentations. Dr. See went to Boston with all of his records for the year. He went to consult with Mr. Lowell about the preparation and publication of these records.

Miscellaneous Notes and Receipts.

Distinction between Catechu and Gambier.—For distinguishing the dyestuffs obtained from Acacia catechu and Uncaria gambier, the author (K. Dieterich) recommends the following fluorescence test: Dissolve 3 grammes of gambier in 25 c. cm. of water. Then add 50 c. cm. of benzine (specific gravity 0·700) and pour the whole in a separatory funnel. After having been left to stand, the layers separate and it will be observed that the benzine shows a more or less intensive green fluorescence according to the duration of the action. Acacia catechu does not produce this reaction.—N. Pharm. Centralhalle.

Exhalation of Blue or Green Wall Paper.—The unpleasant exhalations of papered walls mostly emanate from such wall papers as have a blue or green ground, but also occur with such where the blue or green color constitutes the largest part of the pattern, the dyestuff being chiefly composed of blue or green ultramarine. The latter is perfectly harmless, but has the property of becoming decomposed by slightly sour liquids and to spread a most disagreeable odor of rotten eggs, i. e., to develop sulphureted hydrogen during the slow progress of decomposition. The paste used for fixing wall paper is frequently of a faintly sour or readily souring character, and quickly penetrates the paper, causing the above mentioned effect, as a very slight degree of fermentation suffices to bring about the said unpleasantness. The latter appears more markedly if the walls are slightly damp and already covered with several layers of paper, so that the lime plastering cannot have a neutralizing effect on the lactic acid in the paste, etc. In such cases, therefore, where it is necessary to affix wall paper upon a ground of old paper, as well as in all cases where green or blue wall paper is used, it is recommended to employ only such gluing agents as either do not sour or, if they are inclined to decomposition, contain slight quantities of lime, milk or soda solution, before use, thus excluding the occurrence of the said drawbacks.

Leather Varnish.—Caoutchouc 100, petroleum 100, carbon bisulphide 100, shellac 400, bone black 200, alcohol 2,000 parts. First the caoutchouc is brought together with carbon bisulphide in a well closed bottle and stood aside for a few days. As soon as the caoutchouc is soaked add the petroleum and the alcohol, then the finely powdered shellac, and heat to about 125° F. When the liquid appears pretty clear, which indicates the solution of all substances, the bone black is added by shaking thoroughly and the varnish is at once filled in bottles, which are well closed. This pouch composition excels in drying quickly and produces upon the leather a smooth, deep black coating, which possesses a certain elasticity.

A New Combustible.—In the island of Barbadoes large quantities of a mineral have been found which the natives call "manjak." It is of a bright black color and occurs at a very slight depth, sometimes on the surface in beds 1 to 2 feet thick; it generally appears under an angle of about 40 degrees and in the immediate vicinity of rock. It is presumed to be solidified petroleum, which is often seen there exuding from the earth or floating on the water. In its composition this mineral is similar to the pitch of Trinidad, to the gilsonite of Utah, and the Canadian albertite, but it is of a much better quality. The best varieties of "manjak" contained 2 per cent of water, 70·85 per cent of volatile organic substances, 26·97 per cent of ditto solid ones, and 0·18 per cent of mineral parts. A more general grade showed 5 per cent of water and mineral substance. Trinidad pitch contains 21 to 30 per cent of water and about 38 per cent of ashes; hence the "manjak" mineral is much richer in natural bitumen. It is used, among other purposes, for the insulation of electrical conduits, for varnish, bituminous concrete, and for fuel, mixed with peat, etc. It is expected that it will supplant gutta percha as an insulating medium. —Wallmann's Vers. Zeit.

Official Examination of Foods.—During the month of September, 1897, 202 samples of edibles and drinkables were chemically examined in Berlin, and 57 of them were rejected. Among the rejected articles were milk, butter, lard, flour, fresh eggs, sweet oil, lemon oil, chocolate, green tea, medicinal Hungarian wines, and denaturized alcohol. Remarkable was the large number of the butter samples which were found to be objectionable. Among 25 samples, 2 were pure margarine, 12 were mixed butter containing from 25 to 75 percentum of margarine and 2 samples were greatly suspected of an admixture of margarine. The milk control extended over 1,446 stores and led to the detection of 89 cases of adulteration, etc.; the butter control extended over 549 stores and 56 cases were detected.

Cracking Coal for Cutting Glass.—90 parts powdered charcoal, 2 parts saltpeter, 1 part gum benzoin and 2 parts tragacanth powder. Pulverize all finely, knead with water into dough, roll little rods from it, which are dried. Light these, pass slowly over the glass, and cause a drop of water to fall on it, whereupon the glass cracks off. To be used for cutting off glasses and bottles.

THE EDISON MAGNETIC CONCENTRATING WORKS.

Before describing the remarkable process of crushing and magnetic separation at Mr. Edison's concentrating works in the mountains of New Jersey, it will be well to speak of the elaborate system of prospecting which was carried out to determine the location of the various bodies of low grade iron ore which it is proposed to work by the new process. In iron mining, just as in gold mining, there is a limit to the grade or richness of ore which it is profitable to work in the existing state of the art. Hence the prospectors who for many years have worked over the Eastern iron ore districts have made no record of the existence of deposits which were not fairly rich in iron. As the Edison process was designed to render the hitherto neglected low grade ores commercially profitable, it was necessary to make a systematic prospect of the belt of magnetite deposits. The work was done by means of the dipping needle, and the survey was the most complete ever carried out. It embraced a strip of country twenty-five miles wide, reaching from the Canadian border to the mountains of North Carolina. Several corps of surveyors ran lines across the magnetite belt at intervals of a mile, and wherever the dip of the needle showed indications of ore, a more thorough search of the locality was made. The results were plotted on a map which is the most unique and thorough work of its kind in existence. When this was completed, the company proceeded to purchase or lease the most desirable properties, their holdings at present amounting to some 16,000 acres.

The New Jersey and Pennsylvania Concentrating Works are located on the site of the old Ogden mines, one of those many abandoned iron mines of New Jersey from which the veins of richer ore have been worked out during the century or more in which iron mining has been carried on in this district. The body of ore averages about 200 yards in width, and extends for a distance of over two miles. The average richness of the ore is about 20 per cent of iron. It should be mentioned that although the works at Edison witnessed the first attempt to carry out magnetic concentration on a commercial scale, Mr. Edison had conducted a series of preliminary experiments at Llewellyn Park, N. J. The operations at Edison commenced about six years ago, and the characteristic energy and lavish expenditure with which they have been carried on have resulted in the present enormous and extremely interesting plant.

The visitor to Edison who is familiar with the scope of Mr. Edison's inventive genius—and who is not?—in the design and perfecting of such delicate or complicated devices as the incandescent lamp, the phonograph or the vitascope, will find that in the totally different fields of mining and milling, with their massive machinery and vast operations, Mr. Edison has shown a characteristic originality and freedom from the trammels of tradition. This is evident, not merely in the application of an entirely new system of concentration, but in the preliminary work of mining and crushing, where, surely, most men would have been content to follow the beaten track.

To carry out the process of magnetic separation called for the design of an entirely new plant in itself, and involved long years of patient and costly experiment; and, with a view of cheapening the work of getting out the rock and crushing it to the desired fineness for the magnets, an entirely new method of quarrying and crushing was devised and put in successful operation.

The works are situated approximately midway of the length of the deposit. A system of tracks runs from the crusher house to two powerful steam shovels which are working their way into the ore bed in two different directions. One of these weighs 60 tons and the other—a magnificent fellow weighing 93 tons—is the biggest of its kind ever built. In getting out the rock ready for the crushers, no attempt is made to shatter it to the usual size of say 100-pound lumps by the free use of dynamite. The latter is used merely to loosen up the rock sufficiently for the great shovel to tear it loose and load it on the cars. Consequently it is frequently dug out of the cut in solid masses weighing as much as 5 and even 6 tons apiece and sent to the rolls in this shape. A double track, with a switch at the far end, runs through the cut on a slight up grade. The empties are pushed up and allowed to run back, by gravity, past the shovel, where the rock is deposited on 5-ton skips, of which there are two to each car. The tracks run on each side of the crusher house, and here the skips are picked up by a pair of 10-ton electric traveling cranes and placed on an inclined table in front of the hopper above the "giant rolls." At the foot of this table is a revolving cylinder controlled by the operator, over which the material is fed to the rolls. This arrangement is clearly shown in our front page engraving, where a load is shown falling from the skip into the rolls.

The giant rolls are what might be called the spectacular feature of the whole plant, and to see them seize a 5-ton rock and crunch it with less show of effort than a dog in crunching a bone gives one a vivid sense of the meaning of momentum—for it is momentum that

does the work. The rolls are 6 feet in diameter, with a 6-foot face, and when they are running the masses in motion weigh about 70 tons. They are spaced 7 ft. 2 in. between centers, having a 14 inch space between their faces. The faces are covered with heavy cast iron "slugger plates," which consist of a soft backing with chilled 2-inch knobs. There are also two lines of massive knobs on opposite sides of one roll, which project 4 inches from the face. It is these which strike the smashing blows upon the large masses of rock and break them up for the smaller knobs to act upon. The rolls are run at a normal circumferential speed of 3,500 feet a minute, and it is the energy stored up in the 70-ton mass at this speed which does the work. The rolls are driven by a belt, which serves to speed them up to the desired velocity, but is not depended upon to do the crushing. The pull of the belt is transmitted to the rolls by means of a strap brake acting on the neck of the rolls—as shown in the engraving—which is adjusted by means of a coil spring.

The 93-ton shovel and the giant rolls combined do the work which in the ordinary methods of mining is done by a freer use of dynamite, and it is just here that the first notable economy of this plant is realized.

The rock falls now upon the "intermediate rolls," shown immediately below the "giant rolls." They are 4 feet in diameter, have a 5-foot face and are covered with knobbed plates. Their faces are 7¼ inches apart. The two sets can handle 3,000 tons of rock in a day of 10 hours. After passing through the intermediate rolls the rock is lifted by a wire rope elevator, in which the usual side links are replaced by side ropes in sets of four —an Edison invention, designed to reduce weight and lubrication and facilitate fast running—to a set of 36-inch rolls faced with chilled corrugated iron plates, the aperture between faces of which is about 2½ inches. Unlike the giant rolls these are positively driven; but to avoid breakage connection is made through a split wabbler, which is held together with shearing bolts whose total cross section is such that they will shear off before any breaking strain can be transmitted to the rolls. From the first set of 36-inch rolls the rock passes down to a second set which is similar to the first but spaced with a 1½-inch aperture. From these it falls into a third set, which are 24 inches in diameter with a 20-inch face. These are not positively fixed, but are kept in place by coil springs.

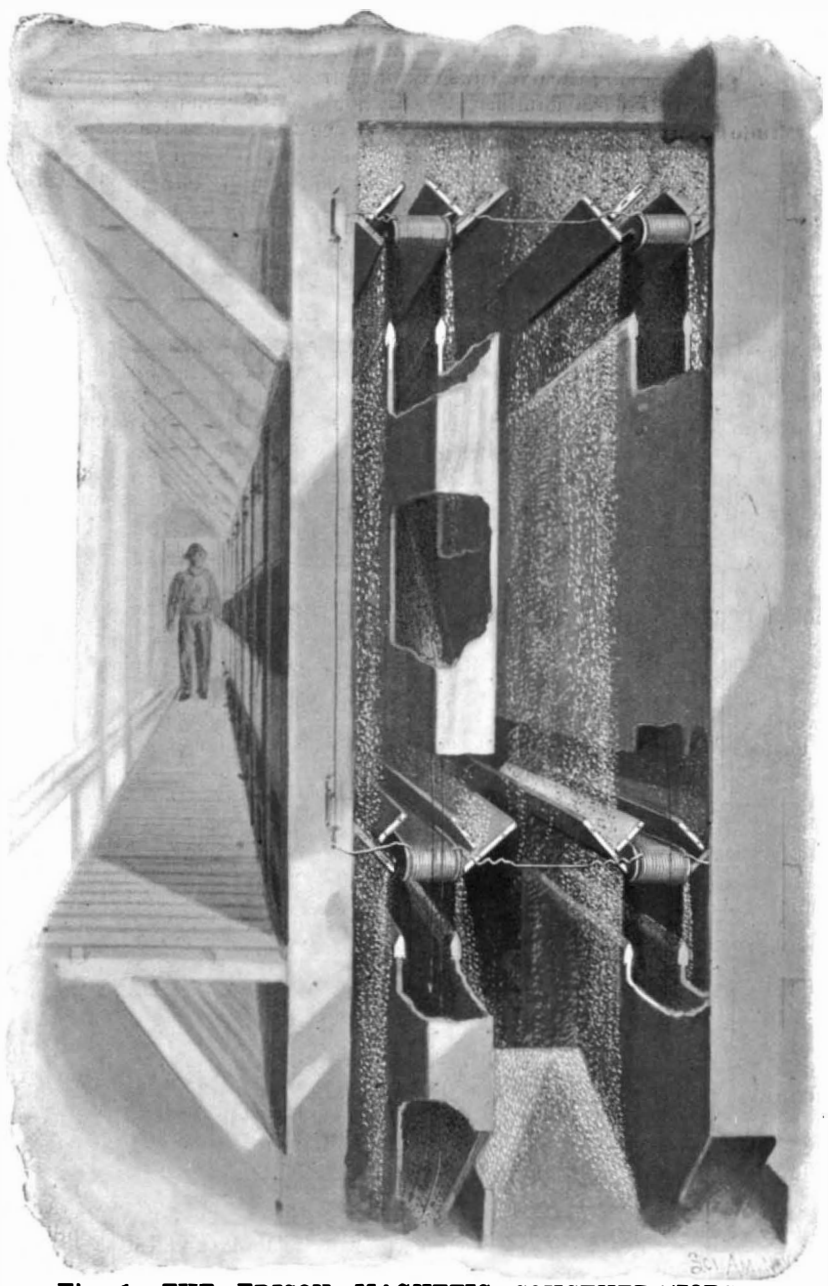


Fig. 1.—THE EDISON MAGNETIC CONCENTRATORS.

By this time the rock has been crushed to a size of not over ½ inch. It falls onto an elevator which carries it to the top of the "drier," a structure 9 feet square and 50 feet high which is filled with a series of cast iron plates 7 inches wide, which reach across the interior from wall to wall, and are arranged one above the other at an angle of 45 degrees, the successive plates facing in opposite directions. The ore is then elevated to a conveyor which runs along the top of a stock house 75 feet wide by 300 feet long, whose storage capacity is 16,000 tons.

From the stock house the material is carried to the three-high rolls in the concentrating mill. This consists of three rolls, the center one of which turns in fixed bearings, while the upper and lower rolls are carried in bearings which are free to slide vertically in the housing. The lower roll is driven through a shearing wabbler, of the kind already described, and the bearings at each end of the upper and lower rolls consist of loose sleeves, on the outside of which are seven grooves. Around the grooves, that is to say, below the grooves of the lower sleeve and over the grooves of the upper sleeve, is wound an endless ½-inch wire rope, which is finally carried up over a single sheave which is acted on by a pneumatic piston. By this means the strain on the rope, and therefore the pressure of the movable rolls on the center fixed roll, may be closely regulated, and an elastic adjustment is provided which removes all danger of breaking the rolls. The ore is fed between the upper and middle rolls and returned between the middle and lower rolls. The faces of the three-high rolls are smooth and they are trued up in place when worn by means of a removable tool carriage mounted on the housing. There are four sets of these rolls in all.

The next step is the screening, which is carried on over ten sets of 14-mesh screens. The rejections are sent back for recrushing in the three-high rolls, and the material which passes through the screens is now ready for the process of magnetic separation.

This process, which takes the place of what is known as the jig process of concentration, is the distinctive feature of the Edison plant. The crushed material is allowed to fall in a thin sheet in front of a series of magnets, which deflect the magnetic particles but allow the non-magnetic rock to fall in a practically vertical line. A thin knife-edged partition board separates the magnetic and non-magnetic streams, technically known as, respectively, the concentrates and tailings, the concentrates being taken to the drier and subjected to further screening and magnetic separation and the tailings, in the shape of sand, being sold as building sand in the open market. The latter, on account of its sharpness, is in great demand, and the company readily disposes of all that the works produce.

There are three sizes of magnets: The 12-inch, the 8-inch and the 4 inch. The crushed ore is first allowed to fall in front of a series of three 12-inch magnets (Fig. 1). The tailings, or the crushed particles of rock which are not drawn over by the magnets, are allowed to go to the sand heaps (Fig. 2), while the concentrates, which have been drawn out of the falling stream by the magnets, are carried to a drier or sent back to the three-high rolls for recrushing. The dried concentrates are then passed through 50-mesh screens and allowed to fall in front of a series of three 8-inch magnets. The tailings again go to the sand heap and the concentrates are taken to what is known as the dephosphorizing room, where they are treated by a special process, invented by Mr. Edison, for reducing the phosphorus. From this room the concentrates are allowed to fall in front of a series of 4-inch magnets, the tailings being sent to the sand heap and the concentrates being taken back for recrushing or being stored in concentrate stock houses. The stock in these houses carries a percentage of 68 per cent of iron.

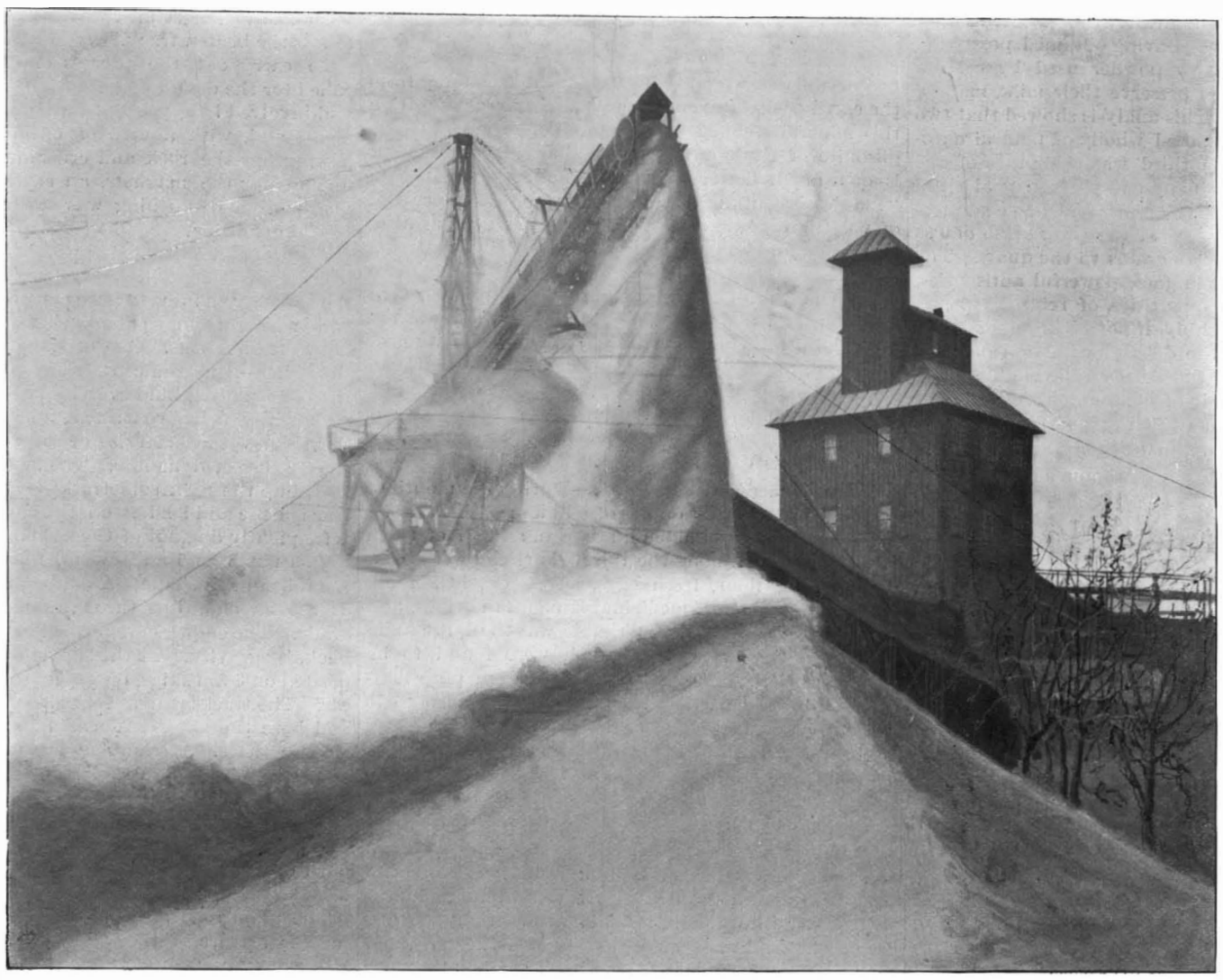


Fig. 2.—THE SAND DUMP—EDISON MAGNETIC CONCENTRATING WORKS.

It was at this point in the process that a difficulty was encountered which called for an extended series of experiments and much costly work before it was overcome. The process of smelting in the blast furnaces demanded that, for the best results, the ore should not be delivered in the

finely divided state which characterized the concentrates from the Edison plant. It was necessary to furnish the material to the furnaces in a condition which would allow the furnace gases to act upon it to the best effect. The Edison concentrates, on account of their fine subdivision would be apt to choke the furnaces and prevent the rapid reduction of the ore.

In order to meet this requirement, it was decided to compress the concentrates into briquettes and deliver them in this form to the blast furnaces. A complete briquetting plant was therefore designed, which has fulfilled all requirements. The concentrates are carried to a mixing house, where a suitable binding material is added, the mixture being carried by means of a trough conveyor in front of a series of briquetting machines. The mixture is forced into dies and compressed in them by means of three plungers, acting in rotation. The first fills the die under a pressure of 800 pounds to the square inch; the next plunger exerts a pressure upon the briquette of 14,000 pounds to the square inch; and the last plunger exerts a pressure of 60,000 pounds per square inch. Two sizes of briquettes are produced—3 inch and 2½ inch; the larger sizes weighing about twenty ounces each.

The briquettes are carried by a bucket conveyor to the baking furnaces, where the conveyor passes up and down through five vertical loops, the briquettes being retained in the furnace for one hour and nine minutes, and exposed to a temperature of 500°. After they have been thoroughly baked, they are unloaded onto a conveyor, which carries them to the railroad cars, by which they are taken direct to the blast furnaces.

The behavior of the briquettes in transit and at the furnaces has been eminently satisfactory. They do not absorb moisture, they do not break in handling and they present sufficient voids in the blast furnaces to insure a complete circulation of the gases around them for smelting.

An analysis of the briquettes shows the following results:

	Per cent.		Per cent.
Iron	67	to	68
Silica	2	to	3
Alumina	0·4	to	0·8
Manganese	0·05	to	0·10
Phosphorus	0 028	to	0·033
Binding material	....	to	0·075

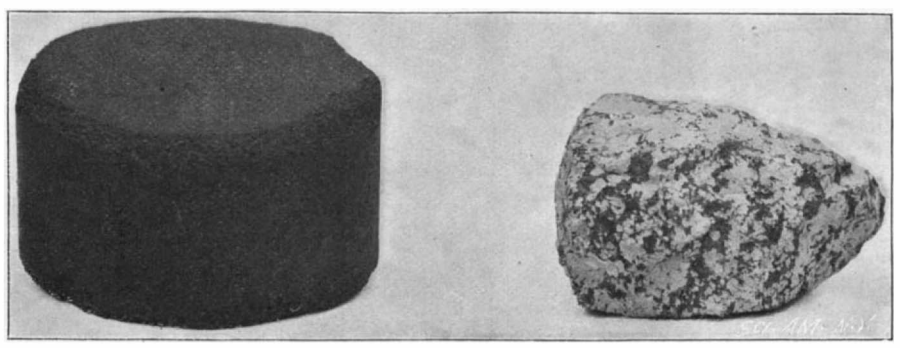
with traces of lime, magnesia and sulphur.

It will naturally be asked, What results have the Edison briquettes shown at the blast furnaces when tested in actual practice? This was determined in 1897 by a trial which was carried out at the Crane Iron Works, Catasauqua, Pa. In these tests various percentages of briquettes were tried in a furnace which produces an average of 105 tons of pig per day when using the ordinary burden. The test was started with 25 per cent of briquettes and extended over five days, 100 per cent of briquettes being used on the last day. With 25 per cent of briquettes the output was 104 tons of pig, and with 100 per cent of briquettes the output rose to 138½ tons per day.

From a study of these figures the reader will see that the yield of pig is largely increased by the use of the briquettes over that secured by the use of the usual ores. Moreover, the trial proved that the consumption of limestone is reduced from 30 per cent to 12 per cent of the charge of ore, with a corresponding reduction in the quantity of fuel used.

The question has frequently been asked: How can this system of concentration be made commercially profitable with its elaborate plant and its frequent rehandling of the material? The answer is that the principle of labor saving, by the adoption of automatic appliances, which has enabled American industries to compete successfully against the world, is here carried out to its fullest development in every part of the works. In the mining, with its giant 93-ton shovel; in the "giant rolls" crushing; in the elevators running at a speed of 250 feet per minute; and in the system of magnetic separation, there is a minimum of manual and a maximum of mechanical labor.

Costly and elaborate as the plant may be, it is noteworthy that about 5,000 tons of ore per twenty hours can be mined, crushed and concentrated with a working force of only 125 men per shift. From the time the deposit of ore is loosened by blasting ready for the steam shovel to the time when the concentrated result is shipped on the cars in the shape of briquettes ready for the blast furnaces, the material never once calls for manipulation by hand.



A BRIQUETTE, 68 PER CENT OF IRON. Fig. 3. A LUMP OF IRON ORE, 20 PER CENT OF IRON.

Herein lies the promise and potentiality of this latest and most radical development in the mining and metallurgy of iron.

THE FUR SEAL.

BY DR. BENJAMIN SHARP, ACADEMY OF NATURAL SCIENCES.

The fur seal, a century ago, was without doubt the most numerous mammal on the face of the globe. To-day, like the bison of our Western plains, it is fast becoming extinct. The rookeries of the north were small compared to the vast areas covered with fur seal in the southern oceans, yet we now hear only of the Commander and Pribylov rookeries, and a small one near the mouth of the Rio Plata, protected by the government of the Argentine Republic.

The history of the seal fisheries in the two polar oceans is interesting, as it shows the effect of lawless slaughter and careful protection. The destruction of the southern seal was accomplished when the Bering Sea fisheries were yielding without injury their maximum number of skins.

The habits of the fur seal* are so regular and so well known that, with intelligent care, the largest rookery could be made to yield a definite annual number of skins, with no diminution of the numbers required to keep up the supply, as nature always produces a large surplus, and from this surplus the skins could be drawn.

As soon as the winter snows have melted from the shores of the islands, the adult males assemble there to obtain a secure footing for the season. Now a fierce and continuous battle ensues for about a month, the "fittest" obtaining the best positions along the shore, the less powerful holding a station back of these, until the whole breeding ground is mapped out, with the strongest bulls of the rookery in definite positions, which they hold and never leave for two or three months. The weaker, generally those under six years, are driven from the rookeries, or not allowed to land, by their pugnacious elders, and are compelled to form a rookery of their own.

The fat, sleek bulls of five or six hundredweight and six or seven feet long, having gained their stations, await the coming of the cows. Nothing can drive these animals from their positions. They stand guard day night, without food, without drink, and, it might almost be said, without sleep. When they return to the water at the close of the season they are thin and haggard, covered with honorable scars. Such endurance is unparalleled among warm-blooded animals.

Bears sleep for months during the dead of winter. Fattening in the fall, they creep to some cave or hollow tree and pass there into a state of hibernation, which reduces them, physiologically speaking, to the condition of cold-blooded animals. The vital activities of their bodies are reduced to a minimum, and yet they appear in the spring, lean and exhausted by this long fast. The bull seal, on the other hand, during his fast, is passing through the most active and violent period of his whole life, and were it not settled beyond question, these facts would scarcely be believed.

This long period away from their natural element is made possible only by the climatic conditions of their resting places. Dense fogs completely envelop the islands during the months when the seals are there, changing with violent winds and heavy rains. In a manuscript journal of a sealing voyage to Cape Horn in 1818, I find that there were only three pleasant days during three summer months. Rain with spits of snow, dense fogs, tremendous hurricanes, is the climate chosen by the fur seal for its breeding grounds, both in the north and in the south.

So completely are the northern seal islands veiled in fog that it took Pribylov eighteen years to find them. After the hunters had exhausted the sea otter on the shores of Kamtschatka, and the fur seal about the Aleutian Islands, this hardy son of one of Bering's crew set about the discovery of new haunts of the fur seal, knowing them to exist from the vast numbers which he had seen about the waters of this part of the world. He finally discovered them in 1786 by means of the seals themselves. Hearing the roar from the enormous rookeries through the fog, he was led to the islands which now bear his name, close to which he had often undoubtedly been. He endeavored to keep the discovery secret from the world, but he was followed and soon the rookeries were common property. Even to-day steam vessels provided with the most improved instruments for

SEAL FISHERIES, PRIBYLOV ISLANDS—BACHELORS ON THE BEACH—ST. PAUL IN THE BACKGROUND.

* The northern form is Callitaria (Callorhinus) ursina; the southern, Arctocephalus australis and other species.

navigation find it difficult to come in with these islands during the time of one of these heavy fogs.

At the arrival of the cows, about a month or six weeks after that of the bulls, the war of the males is at its height. Before this it was a struggle for the most favorable position, now it is for the largest family.

Soon after the arrival of the cows the "pups" are born. A view of the rookeries at this time is one of the greatest sights of the world. Thousands upon thousands of black bodies, in constant motion on the black volcanic shore, give the effect of the whole coast being alive. The ceaseless, hoarse barking of the seals fills the air with a continuous roar, while the sea beyond is alive with the dark, lithe forms of these graceful animals. On closer inspection a certain regularity will be observed on the rookeries at this time; at each station is a bull surrounded by a family of cows, one-third his size. These families are distinct, with an open space about them, which allows the passage of the cows to and from the water, for, unlike the bulls, the cows pass to the sea and feed there during the whole of their stay in the region.

When about six weeks old, the pups establish a rookery for themselves and commence the arduous task of learning how to swim. Although aquatic animals, living most of their life in the water, the young at this time are as helpless in the water as a child would be. Not like the duckling, which takes to the water by instinct, upon the breaking of its shell, the pup seal must learn slowly and laboriously this intricate art. From simply wetting themselves at first, to playing in the shallow water, they by degrees learn the movements and finally gain the strength to leave in the fall with their parents for the North Pacific Ocean. The antics during this part of their education are very amusing. Their plays, their duckings of one another, remind us of boys, and when one has hauled out" to rest, if he dozes for a moment upon a polished bowlder, we may almost hear the laugh of merriment of his companion as he shoves him off into the water and gains the comfortable place for himself.

The young males, from one year to six years of age, the so-called bachelors, which have been unable to land upon the breeding grounds, establish their rookery and then lead an idle, peaceful life of feeding and sleeping. They take to the water in common with the cows for food. By this arrangement the growing males and sleek females scour the waters for miles about their "hauling out" grounds, and, being voracious beasts, the fish or squid, if there be any near the islands, are soon eaten, and further and further to sea must they go in search of food.

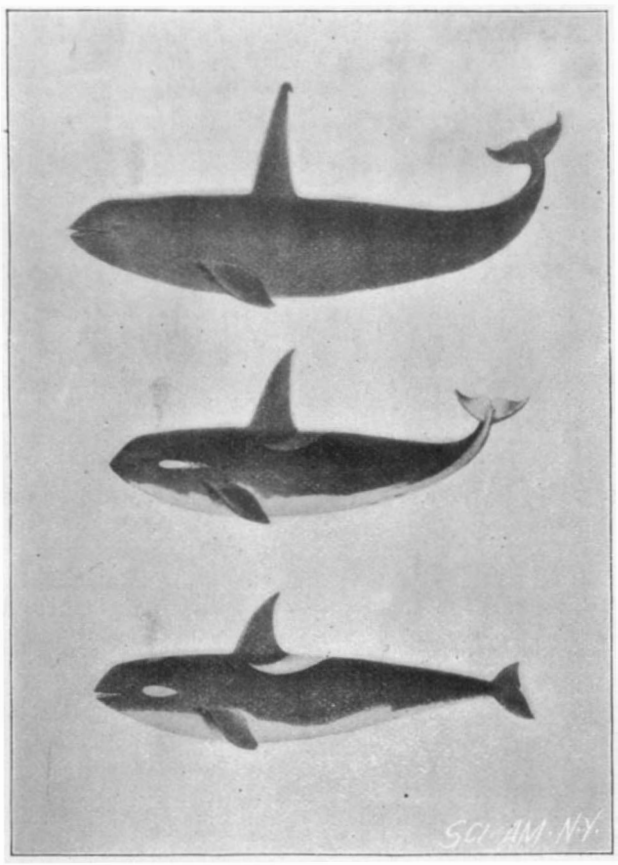
The "sixty mile" limit, within which no pelagic sealing is allowed, is soon too small for these active animals to obtain their food, and they are compelled to go beyond this narrow limit to feed, and there they fall an easy prey to the expert rifleman.

From the bachelor rookeries at the Pribylov and Commander Islands are drawn the seals which give the skins to commerce. No others are taken. When the killing season arrives, herds are cut off from the sea at the rookery, and are driven to the killing grounds. Any female which happens (but this is rare) to get into these herds is allowed to escape back to the shore. The herd is driven on, they arrive at the killing grounds near the village and are allowed to cool off, for skins would not retain their fur if the animal be killed when overheated. They are killed by a deft blow upon the head, then dexterously skinned; the skins are then salted, stored and are ready for shipment.

Such is the method pursued on the rookeries which are under government protection. When Elliot studied the seals on the Pribylov Islands, during the years 1872 to 1874, he estimated that from the four and a half million of seals frequenting the islands of St. Paul and St. George, one hundred thousand skins could be taken annually from the bachelor rookeries, without injury to the islands. He says: "Provided matters are as they are today (1872) one hundred thousand male seals under the age of five years and over may be safely taken every year from the Pribylov Islands, without the slightest injury to the regular birth rate or natural increase thereon; provided that the fur seals are not visited by any plague or pest, or any abnormal cause for their destruction which might be beyond the control of men; and to which, like any other great body of animal life, they must ever be subjected to the danger of."

To-day ten or fifteen thousand is the greatest number which can be taken from the bachelor rookeries, so greatly have the seals diminished in numbers. What has caused this falling off?—for we know that no epidemic has visited these islands.

To-day one of the most pitiful sights is a view of a pup rookery on the Pribylov Islands. The shore is dotted with pods of pups, fat, sleek and pugnacious; sleeping, scratching, at times fanning themselves with their large leathery flippers. But among these we see wandering some mere skeletons covered with harsh, unkempt skins, crying piteously, starving. Mothers giving rich food to their happy young; the starveling wailing for its mother who will never return, who has been shot at sea by the pelagic sealer. For a month or more the miserable, starving creature wails among its vigorous companions; weaker and weaker it becomes, the cry dies to a moan, and then it festers upon the black volcanic shore of the rookery.



THREE SPECIES OF THE ORCA OR KILLER WHALE.

Of course accidents will, in the course of nature, cause the death of the mothers, but these will not account for the thousands of dying pups upon the shores. The orca or killer whale and the shark are the only natural enemies of these animals, and these are rarely, if ever, found about the waters of the Pribylov Islands.

From the habits of the seal it will be seen that the only animals which fall into the hands of the pelagic sealers are the females and bachelors, and consequently every mother killed means the death of a pup upon the shore. In this sense, much more humane is indiscriminate sealing—wholesale slaughter—as it was carried on in the south, leading, it is true, to the extermination of the seal in the locality.

PUP ROOKERY GROUP OF STARVING PUPS.

In 1774 Captain Uriah Bunker, of Nantucket, first led the American whaling fleet across the equator into the South Seas. This led to the discovery of the enormous seal rookeries about Cape Horn, the Falklands, and the islands of the Antarctic continent. Many of these whalers took "elephant" and seal oil to make up their "voyages," as no extra apparatus was necessary. On the authority of A. H. Clark, the first vessel which sailed especially for fur seal was fitted out shortly after the close of the Revolution by a lady of Boston of the name of Haley. This vessel brought to New York 13,000 skins, which sold there for fifty cents apiece, as neither their value nor their nature was known. They were later sold in Calcutta for five dollars. Just one hundred years ago, the "Neptune" cleared $200,000 on fur skins taken in the Southern Ocean. These southern voyages were generally from a New England port. Getting their cargo near Cape Horn, they then sailed for China, where the skins were exchanged for teas and silks.

The value of the fur seal skin in the Orient was so great that many vessels fitted out for the lands of the Antarctic Ocean and to the southern coasts of South America. Seals were discovered in incredible numbers in this new region. For instance, it is estimated that over one million seals were taken on the coast of Chile, from the island of Masafuera alone, which is but twenty-five miles in circumference.

As the rookeries in one place were destroyed, new ones were discovered and soon swept of their valuable inhabitants. Many of these sealing voyages were almost as much voyages for discovery as for wealth. The rediscovery of Pitcairn's Island was made by Mahew Folger, of Nantucket, who was cruising in the South Pacific in search of new sealing grounds in the ship "Topaz," of Boston. His surprise at finding a colony here, and a colony founded by the supposed lost mutineers of the "Bounty," is well told in his log of this voyage, which is still in existence.

Between 1820 and 1821, 300,000 skins were taken from the South Shetlands, and in a few years nothing remained but a history of the millions of animals which yearly resorted to these islands.

Some of the vessels fitting for the South Seas had such inexperienced crews that the voyages were unsuccessful or the cargoes ruined. There is on record a vessel which took 100,000 fur seal skins to London in bulk. On arrival they were found to be utterly ruined and were dug out of the hold and sold as manure.

This form of sealing was at one time carried on at the Aleutian Islands, where 200,000 skins found their way yearly to the Chinese market. This led to the extermination of the seals on these islands, and when the Pribylov Islands were discovered, the rigid laws framed and carried out by the Russian government alone saved the fur seal from total destruction.

By 1830 the enormous rookeries of the Southern Ocean were practically destroyed.

When the sealers first visited the southern rookeries the seals were so tame that they played fearlessly about the men who were skinning those which they had killed. The seals, however, became acquainted with their destructive visitors and soon learned to escape to the water on the approach of a boat. Sentinels, it is stated, kept watch on high points of the rookeries and gave warning; when instantly the whole rookery was in motion, making for the water. The mothers, seizing their helpless young by the napes of their necks, dashed through the surf, coming frequently to the surface to allow the pups to breathe.

The killing of animals by aborigines is never of such a nature as to cause their extinction. The numbers of seals about the islands of Cape Horn and the adjacent continent, although used for food and clothing by the Patagonians, never decreased the number of seals any more than did the natives of the Aleutian Islands before their discovery by the Russians.

The tabooing of fish at certain times by the Polynesians shows the care with which the natives study nature and carefully protect their food supply.

Wholesale slaughter is the most effective method of extermination, while careful preservation will keep the seal at its full breeding capacity for an indefinite period.

When this protection is interfered with, in other words, when the capital is drawn upon, it is only a question of a few years when the animal will become extinct.

It may be taken as a general rule that the number of young born to an animal stands in definite relation to the dangers to which they are subjected while passing from birth to maturity. Thus small animals, as mice, rabbits, etc., which form the food of so many carnivorous birds and beasts, are more or less individually defenseless. The defense of the species, therefore, is the large number of young born to the parents. The murres and petrels lay but one egg, but they are so well protected by nature that they are the most numerous birds in the world. So it is with the seal. It is settled that never more than one young is born to any mother in one season, and before man appeared upon the scene their numbers were legion.

Ample evidence upon all these points is at hand. "Game laws" have existed and have been tried long

enough at the Pribylov Islands to show that they are thoroughly effective. As soon as the pelagic sealing became lucrative and was allowed, drawing as it did upon the principal of the estate, and thus infringing upon the preserve, the seals rapidly diminished in numbers, and at the present rate, if nothing is done to prevent it, will, without the slightest question of doubt, leave the Pribylov Islands as bare of seals as the lands about Cape Horn.

Tapping the Rock for Water.

Baron Nordenskjöld's system of boring for fresh water through the granite rocks of Sweden has now been in operation for two years. The Geographical Journal says that forty-four wells have been bored. This is not alone a question of finding water, but of the discovery of a new and important principle.

The difficulty in obtaining good drinking water at many of the pilot and light stations on the rocky islets off the Swedish coasts first induced Nordenskjöld to consider the subject. He believed from his researches in Spitzbergen that a horizontal crack would generally be found to exist in all solid rocks at an insignificant depth beneath the earth's surface. Consequently, in the Swedish rocks, he concluded that water would be found by boring to this crack. The only places where there was any prospect of such borings being undertaken were on out-of-the-way rocks and islets, where water was so much needed.

In order to solve the problem, Baron Nordenskjöld, as early as 1885, inquired respecting the saltness of water in wells or mines near the seacoast, and collected some important information. He was told that several wells, in sedimentary strata, near the seacoast, yielded water free from salt, although the springs are at a depth of 100 to 250 feet below sea level. The information he collected, though far from conclusive, appeared to point to the fact that water obtained by boring on rocky islands would not be salt or brackish, but fresh drinking water.

Nordenskjöld, therefore, proposed to the chief of the pilot stations that he should allow an attempt at boring to be made at some suitable station. The first boring took place in 1891, on the little island of Svangen, south of Kosterfjorden. It was abandoned after reaching a sufficient depth, because a long crack was reached extending from the sea to the boring hole. It was next taken up in May, 1894, by Baron Ruuth, the General Director for Pilots, who, regardless of the unsuccessful boring at Svangen, caused a second experiment to be tried at Arko. The site selected was a flat place near the pilot station, the rock being composed of hornblende, gneiss and diorite. The results were very satisfactory. As soon as a depth of about 100 feet was reached they came to excellent water, yielding 600 quarts an hour. At first the water was a little yellow, owing to the clay in the cracks of the rock, the stone dust and oil from the boring, but it soon became perfectly clear. Water has always been found at a depth of 90 to 125 feet, and similar borings have since been carried out successfully at forty-four different places. At first the water is mixed with the clay from the cracks, the stone dust and the oil from the machine, and it is some time before all the dirty water is pumped away; but soon it becomes as clear as crystal. At Stockholm it has a temperature of about 43° to 45° F.

The boring in hard, close rock would probably have the same results in other countries. Baron Nordenskjöld is convinced that wherever hard, close rock exists, with variations in temperature and not permeable, water will be found in the same way as in Sweden, and in the same quantity, that is, from 600 to 2,000 quarts an hour, with moderate pumping. Sites for such borings could be found, for example, on many parts of the north coast of Africa, in Abyssinia, in South Africa, in Spain, and other parts of the western Mediterranean, at the foot of Mount Sinai, in Greece and Asia Minor, and in the dry watersheds of the canyons of the Colorado. In the tropics, where there are dry seasons, such wells cannot supply water for extensive cultivation. But they will spring forth, free from all bacteria and impurities, and will suffice for household purposes, for small villages and for gardens. The practical importance of Baron Nordenskjöld's discovery entitles it to special attention.

DR. ARTHUR Y. BENNETT, of Erie Co., recently read a paper before the New York State Medical Association upon "Massage as an Occupation for the Blind," in which he called attention to the large and increasing number of blind persons, most of whom are dependent upon others for their support, and said that the estimated number in this country is 56,000, of which 4,398 are in this State. In order that many of these may become self-supporting, he advocates that they be taught massage in the State institutions, being trained in the anatomy and physiology of the body before they learn the practical work. He considers that the peculiar delicacy of touch which the blind possess makes them especially fit for this kind of work.

SPINNING AND BALANCING TRICKS.

BY W. B. CAULK.

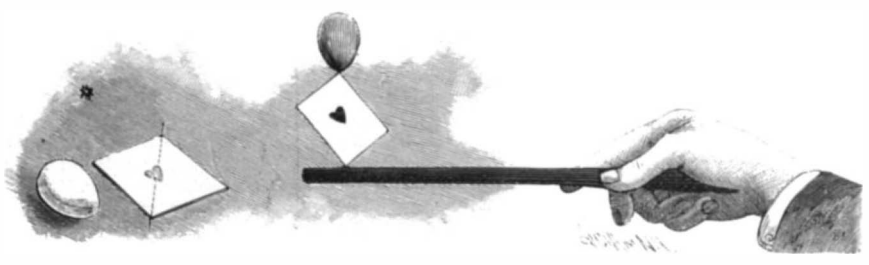
The spinning handkerchief is a great favorite with jugglers. A handkerchief is borrowed, thrown in the air and caught on the end of a whirling stick held by the juggler, when the handkerchief spreads out to its full size and commences to rapidly spin around. The secret is that in the end of the stick a needle is inserted about one-quarter of an inch, leaving the sharp end out. When the handkerchief is caught on the end of the whirling stick the needle point passes through it, thus preventing it falling off the stick, which is rapidly whirled around, and the handkerchief will spread out and spin about on the end of the stick.

Jugglers are very partial to tricks performed with eggs, and spinning an egg on its smaller end is a trick they are almost sure to perform. It is impossible to spin a raw egg; so our juggler uses a hard boiled one, and spins it on its small end in a shallow japanned tray. If the tray is kept gently moving in a small circle in the opposite direction to that in which the egg is spinning, the latter will continue to spin as long as desired.

THE SPINNING HANDKERCHIEF.

The egg spinning trick is usually followed by a balancing trick in which a playing card is balanced upon a small wand, and an egg is then balanced on a corner of the card. This trick usually calls forth a great pretension of skill on the part of the performer, when in reality no skill whatever is required.

The wand is of ebony, or some dark wood, and about three inches from one end is a small hole. The egg is made of wood, painted white, and with a small hole in one end. The card is composed of two cards glued together, with a fine steel wire between them, running diagonally from corner to corner of the card, with the ends of the wire projecting about a quarter of an inch. The prepared egg is on a plate with several ordinary eggs, and the card is placed on a pack of common cards. The wand is held in one hand, the card taken in the other and apparently balanced on one corner on the wand, but in reality the wire point is placed in the hole in the wand. Now the assistant passes the prepared egg to the juggler, who carefully balances it upon the corner of the card, that is, slips the hole in the end of the egg over the wire point projecting from the card.



BALANCING CARD AND EGG ON WAND.

A fitting finale to such a juggling act is that in which a potato is placed on the hand of the assistant and cut in two with a sharp sword, without leaving any mark upon the skin. As a general thing, a second potato is then cut upon the throat of the assistant. This apparently marvelous mastery of the sword always brings forth great applause.

Among the several medium sized sound potatoes on a tray are placed two potatoes prepared as follows: Insert a needle crosswise of the potato near the bottom. After showing the sword to be really sharp, by cutting paper and slicing one or two of the potatoes, the performer picks up one of the prepared potatoes and places it on the assistant's hand; but apparently it does not lie to suit him, so he slices off one side of it, using care to cut away the side just under the needle and as close to it as possible, then places the potato once again on the assistant's hand. After making a few flourishes with the sword, he cuts through the potato, dividing it in half.

In striking the potato with the sword he makes sure that the sword will come exactly crosswise on the needle; consequently, when the sword reaches the needle it can go no farther, and the brittle nature of the potato will cause it to fall apart, the very thin portion below the needle offering no resistance to the separation. The second potato is then cut in the same manner on the assistant's neck. There are many other false juggling tricks, but the above will suffice to show that "there are tricks in all trades but yours."

Street Washing in Oldenburg.

Undoubtedly one of the best methods of keeping streets clean is that of frequent flushing with water, says The Electrical Engineer, especially when the sewer outlets are so planned as to permit all the solid refuse to be washed out through them along with the water. In many cases, however, the supply of city water does not permit the liberal flow necessary for a thorough flushing, so that this luxury can be permitted only when an excess of water is on hand. The city of Oldenburg, near Lubeck, has provided an independent water supply for the especial purpose of keeping the streets washed, this being one of the numerous sanitary improvements which have resulted from the cholera epidemic of 1892 in the north seaports. In order to avoid the cost of new buildings, the pumping plant is placed in one of the electric stations where space was available, the water being taken direct from the river Hunte, the pumps being driven by belts from turbines. A system of high-service mains, altogether distinct from the regular water supply, is connected with this pumping plant, and a pressure of 65 feet head is maintained by an automatic regulator, permitting the excess of water to be returned to the river whenever the demand is reduced. This high-service pumping system supplies thirty-seven flushing hydrants, placed at such points of elevation as to permit the streets to be cleared by the slope. The hydrants are so arranged that their ordinary discharge is through openings in the curb at the gutter line, but they can also be immediately converted into fire plugs for hose attachment, either for street sprinkling or for fire engine supply. Since the river water at Oldenburg is unfit for household use, the plant above described is available only for the special purposes for which it was planned, but the expense of thus using a local supply of brackish water for purposes of street washing and fire service is so moderate that the method is worthy of consideration in other localities. The entire cost of the Oldenburg plant was less than $7,000—that is, less than $200 per hydrant—while the economy in street cleaning alone would soon repay this, after which the cost of operation would be much less than by any other method, not to mention the superior sanitary advantages.

Pneumatic Sleeping Cars.

Sleeping on air is the latest innovation in railway travel, says The Sanitarian. The use of compressed air for this purpose will, in the estimation of railway men, eventually revolutionize railway travel, and relegate the familiar and somewhat clumsy Wagner and Pullman sleeping cars to the background

At present the only car completely fitted with compressed air cushions and beds is the private car of Vice President J. N. Schoonmaker, of the Pittsburg and Lake Erie Railroad. These have been found, however, to be not only practicable, but to possess so many advantages over the accommodations of ordinary sleeping and parlor cars that a number of roads are having similarly fitted ones constructed, and before long they will be in general use on many of the great trunk lines of the country.

Colonel Schoonmaker's car in appearance does not differ externally from the ordinary private car of railroad officials. The interior by day is that of a handsomely fitted up parlor car. The customary chairs are seen on each side of the car, and they are covered with plush. When one sits in them, however, a marked difference is noticed from the ordinary car chair. This is explained by the fact that, instead of the usual upholstering, the chair cushions are filled with compressed air, which lessens, in a great degree, to the occupant, the jolting and jarring of the car when in motion. During the day no one would for a moment suppose that he was riding in a sleeping car, and it is not until the day coach is transformed into a sleeper that the possibilities of the use of compressed air in this direction are fully realized.

The transformation is effected in this wise: First, the air in the chair cushions is exhausted, the light framework folded up and slipped into an opening in the side of the car. Thus all the seats in the car are disposed of and it is ready for the beds.

The panels on each side of the windows open outward like a door. On the inside of these panels is a metal track, over which is drawn a steel, springlike arrangement which supports the bed. Fitting closely against the sides of the car and concealed during the day by the closed panels is a rubber bag, folded after the fashion of an accordion.

Hard Times and Drink.

It is evident that hard times have contributed to a notable diminution in the use of all kinds of beverages, but particularly spirits. Possibly the bicycle has contributed to decrease the patronage of saloons, but, whatever the cause, the following official figures show that the consumption of alcoholic stimulants has not increased, while the use of the milder beverages has barely been steady.

PER CAPITA CONSUMPTION OF LIQUORS.

	Spirits, Gallons.	Wines, Gallons.	Beer, Gallons.	Total Gallons.
1896	1·00	0·26	15·10	16·42
1895	1·12	0·28	16·08	16·35
1894	1·33	0·31	15·18	16·82
1893	1·51	0·48	14·95	18·04
1892	1·50	0·44	15·16	17·04

These figures are surprising, in view of a reduction in the use of spirits from one and one-half gallons to one gallon per capita in five years. Naturally, under such circumstances, one looks for an increase in the use of the milder stimulants, but, instead, we find the use of wines has decreased from about one-half to one-quarter of a gallon per capita, while the use of beer has been stationary, whereas during the five years, 1887 to 1892, it rose from 11·23 gallons in 1887 to 15·28 gallons in 1891, a period of marked prosperity. In 1896, 71,263,000 people used less spirits than 58,680,000 people did in 1887. About 11,000,000 gallons of spirits are used annually in the arts, manufactures and medicine, so that deducting that quantity leaves about 60,000,000 gallons for use as a beverage. Barrooms show an average of sixty drinks per gallon, returning about $4.50, thus making the nation's whisky bill in 1896, as a beverage, $270,000,000, while in 1892 and 1893 it averaged $400,500,000. This decrease accounts for a big loss in revenue, officially reported in 1896 at nearly $14,000,000 less than in 1893. Foreign spirits are in favor in fashionable circles, and yet the importations in 1896, while heavier than for the four preceding years, were lighter than in 1890 or 1891.

Beer disputes with coffee the claim to be the national beverage. Twenty years ago the per capita consumption of beer was less than one-half of what it is to-day, or six and one-half gallons, against fifteen gallons in 1896. During the prosperous years 1891 and 1893 the consumption reached its maximum, rising in 1893 to 16·08 gallons, since which date it has fallen off about one gallon per capita, averaging for the three years ending with 1896 fifteen gallons per capita annually. Hard times and bicycles explain this decrease in the use of malt liquors. On the basis of 50 cents per gallon for domestic beer and $1 for imported beer, as the cost to the consumer, we have a total expense for that item in 1896 of $541,963,348. It is very evident that Americans are not given to a free use of wines. The consumption of domestic wines in 1896 was less than one-half the quantity used in 1888, leaving out of question an increase in population of 12,583,000 people. Less imported wines are used than formerly. In 1883 the importations were more than double those in 1896, and over 1,500,000 gallons less than in 1893. The figures ought to encourage the friends of temperance, although they may be discouraging to the wine industry of the United States. Assuming that domestic wines cost the consumer $2 per gallon, the nation's bill in 1896 for that item was $29,199,514. The importations of that year were valued at the custom house (plus duties) at $10,265,465. Allowing 100 per cent profit to distributers, the cost of foreign wines for the year 1896 was $20,530,930, which, added to the cost of domestic wines, makes the nation's wine bill for 1896 $49,730,444.

Bringing the above items of the cost of alcoholic beverages together, we have the following as the drink bill of the American people, so far as alcoholic stimulants are concerned: Beer (domestic), $538,662,857; beer (imported), $3,300,531; whisky (exclusive of quantity used in arts), $270,000,000; wines (domestic) $29,199,514; wines (imported), $20,530,930; grand total, $861,693,832; estimated cost in 1892 on the same basis, $1,000,884,277; estimated cost in 1891 on the same basis, $934,813,314. Is not the above full of encouragement to advocates of temperance? There is a wonderful decrease in the use of ardent spirits and wines and no gain in the use of beer. A comparison of the ten years' record indicates that good times foster the use of alcoholic stimulants. If we study the tables showing the consumption of non-alcoholic stimulants, we find the same conditions governing their use. Measured by the number of gallons of the beverage consumed, coffee ranks next to beer as a popular beverage. Assuming that one pound of coffee makes two gallons of infusion, we have a year's consumption of 962,088,692 gallons at a cost of $120,261,086. The per capita consumption of tea does not increase; in fact, is less than it was twenty-five years ago, when it averaged one and one-half pounds, against one and three-tenths pounds in 1896. The import cost of the tea received in 1896 was $15,585,741. The retail cost was at least double this, or $31,171,482. It is safe to say that one pound of tea as ordinarily brewed will make five gallons of beverage, on which basis there was in 1896 a total consumption of 466,701,240 gallons, costing 6⅔ cents per gallon, thus making tea the cheapest of all beverages in general use. The 1896 imports of crude cocoa, leaves and shells amounted to 23,276,597 pounds, valued at $2,387,078. A large part of this is used for confectionery and other purposes than as a beverage, but it is safe to estimate that the retail cost of the chocolate and cocoa used as a beverage does not exceed $3,000,000.

Bringing the above items into one group, we find that the United States consumed in 1896 alcoholic and non-alcoholic stimulants to the value of $1,016,126,400, as follows: Alcoholic drinks, $861,693,832; non-alcoholic stimulants—coffee, $120,261,086; tea, $31,171,482; cocoa, $3,000,000; total, $1,016,126,400. The above represents a yearly per capita expenditure for beverages of $14.31 for the 71,000,000 inhabitants of the United States, or 4 cents per day. Evidently hard times have cut down the appetite for beverages of all kinds, and render distilleries hazardous industries. Breweries and coffee mills are far better property. The statistics above have been secured by The American Grocer.

Necessity of Cover During Sleep.

The object is simply this: Nature takes the time when one is lying down to give the heart rest, and that organ, consequently, makes ten strokes less a minute than when one is in an upright posture. Multiply that by sixty minutes and it is six hundred strokes. Therefore, in eight hours spent in lying down the heart is saved nearly five thousand strokes, and as the heart pumps six ounces of blood with each stroke, it lifts thirty thousand ounces less of blood in a night of eight hours spent in bed than when one is in an upright position. As the blood flows so much more slowly through the veins when one is lying down, one must supply then with extra coverings the warmth usually furnished by circulation.—Popular Science News.

RECENTLY PATENTED INVENTIONS.

Engineering.

REVERSIBLE ROTARY ENGINE.—George W. Smith, Petersburg, Ill. The cylindrical body of this engine has sets of inlet channels arranged diametrically opposite each other, the abutments for each set being formed with angular ports, those of one set standing in an opposite direction to those of the other set. A piston turning in the cylinder has piston heads against which the motive agent acts, and a reversing valve connects either set of channels with the motive agent supply, so that by merely shifting the reversing lever the engine can be rotated in either direction. The engine is designed to be of simple and durable construction and very effective in operation.

GAS ENGINE.—Clinton Guyer, Muncy, Pa. This invention provides a construction according to which the speed of the engine is fully under the control of an automatic governor, the engine taking only such charge of gas or gasolene as the work requires, and the gas and air being admitted in proper proportions. A combustion cylinder in which are sparking devices communicates with the piston cylinder, a mixing cylinder communicating with the combustion cylinder, and a gasolene container having a valve-controlled communication with the mixing cylinder. There is an air-controlling valve on the mixing cylinder and a valve-controlling shaft operated by the crank shaft, a cam on this shaft engaging a fulcrumed lever having connection with the valve in the gasolene container, there being means for regulating the throw of the valve.

INCREASING EFFICIENCY OF COMPRESSED AIR.—John McIntyre, Jersey City, N. J. Instead of heating compressed air as heretofore, previous to its entering the motor, this invention provides an apparatus comprising a casing in which is a combustion chamber and a vapor chamber, both having their bottoms in free communication with a condensing liquid, there being a valved igniting chamber connected with the top of the combustion chamber, and the products of combustion passing through the liquid to reach the vapor chamber, an outlet pipe from which connects with the motor. The motive agent thus produced is of the same volume as the compressed air originally supplied, but its heat units and moisture are considerably increased at but slight expense for the oil or gas used.

SAFETY STOP FOR HOISTING ENGINES.—James E. Richards, Calumet, Mich. In raising and lowering cages in mines, this invention provides a safety stop to automatically control the admission of the motive agent, the brake mechanism and the reversing lever, in case the speed of the engine is not checked before the cage reaches the landing. A screw rod on which travels a nut is driven from the engine in unison with the movement of the hoisting cable, and a tripping arm is adapted to be raised by the nut and moved in engagement with the governor or other movable part driven from the engine, the tripping arm controlling a device connected with the admission valve, the brake mechanism and the reversing lever.

HOISTING APPARATUS.—William J. Webster, Oakdale, Pa. This is an improvement in apparatus for use in connection with the drilling of wells, there being a continuously driven shaft and means by which the hoisting drum may be readily thrown in and out of gear with the shaft. Two aligned shafts are arranged in stationary bearings, one of the shafts being slidable in its bearings, and clutch members are carried by the contiguous ends of the shafts, to be engaged and disengaged by the sliding movement of the slidable shaft. Means are provided for so sliding one shaft, and on this shaft and moving with it is a brake collar to engage one of the bearings upon the disengagement of the clutch members.

GENERATOR.—John O. Morris, Richmond, Va. This is a device to be arranged in the ash pit door, to supply mixed steam and oxygen under the grate bars of the furnace. The entering flue has a funnel-shaped outer mouth through which a supply of air is drawn, and in one side of this funnel is a steam jet nozzle, while in the flue, in the rear of the nozzle, is a mixer, composed of wheels arranged to be acted on and turned by the steam. Three wind wheels are used in the flue, arranged in a manner to efficiently draw in the air and mix it with the steam to most effectively promote combustion.

CONDENSER.—Albert Hoberecht, Ensanada, Mexico. For condensing the vapors from steam or other generators, this invention provides an apparatus in which the condensing chamber may have baffle plates, air circles and side draught flues, a vapor drum encircling a cold air pipe in the condenser proper, to which leads an air inlet pipe, while a vapor pipe leads from the drum into the air inlet pipe. A graduated siphon nozzle enables the operator to readily control and regulate the passage of vapor to the condenser proper, according to the pressure indicated by the gage or the discharged products of condensation.

Railway Appliances.

REFRIGERATOR CAR.—Andrew J. McArthur, Gainesville, Fla. This car has an interior casing, affording air spaces at the top, bottom and sides, and arranged in the sides are woven wire ice receptacles to be filled from openings in the car roof. Coiled pipes have communication with the ice receptacles and siphon pipes connected with the coil pipes lead through the bottom of the car, drip pipes connected therewith being extended upward and downward. The arrangement is such that the pipes may be easily and quickly cleaned, while the cold air will be evenly distributed throughout the car, rendering it especially advantageous for the transportation of meats and other perishable articles.

CAR COUPLING HOSE HANGER.—Benjamin S. McClellan, New Orleans, La. This invention relates to a former patented invention of the same inventor, providing for the holding in proper position of the coupling ends of the uncoupled hose, preventing it from kinking and cracking, and sealing the opening to exclude dirt, etc. A chain, connected to the under side of the car coupling, is attached to a clamp on the free end of the hose, and on the clamp are bearings for a bolt forming a pivot for a lever carrying a conically shaped valve adapted to engage a gasket in the open end of the coupling member when the latter is disengaged from the other member, whereby the coupling member will be automatically closed when the members are disengaged.

Electrical.

TELEPHONE TRANSMITTER.—David A. Fleming, Indiana, Pa. According to this invention the pressure upon the diaphragm and the distinctness of transmission are designed to be regulated with great nicety by a novel pressure or tension device. A tube or channel is mounted to turn adjacent to the diaphragm and inclined relatively to the axis of rotation, the tube being mounted to turn without affecting the fastening of the diaphragm, while loose conducting material, such as carbon or metallic balls, is placed in the channel to engage the diaphragm. The construction affords means of simple and ready adjustment for obtaining the required pressure on the diaphragm.

POTENTIAL REGULATOR FOR DYNAMOS.—Allen A. Tirrill, Whitefield, and Phill S. Tirrill, Groveton, N. H. This governor provides for automatically regulating the voltage on the supply wires, to always maintain an even potential under the varying demand from the starting and stopping of motors or the throwing in or cutting out of electric lights, etc. It consists of two vertically arranged solenoids, the cores of which are loosely connected to each other and to a pair of levers, there being a spring for pulling down the inner ends of the levers, and two contact points, one carried by the levers and the other by an adjusting screw. The invention is distinguished by the means provided for balancing the solenoid core and adjusting the sensitiveness of the contacts of the field magnet shunt, which is very necessary to the automatic regulation of the potential.

TROLLEY GUARD.—Herman J. Vogler and Alfredo Flores, San Antonio, Texas. A pair of spring-held but yielding guards, according to this invention, is arranged one on each side of the trolley wheel, the guards being bowed or loop-shaped and hung on the axle of the trolley wheel. The guards hold the wheel on the wire but yield in passing under the cross supporting wires without damaging the latter. The guard may be used with the ordinary trolley pole, and works equally well in going either forward or backward.

Bicycles, Etc.

AIR PROPELLED BICYCLE.—David A. Moore, Harvey, Ill. This wheel has no chain or other gear, the pedals being used to operate an air pump, the air compressed by which is conducted to a specially constructed rotary engine arranged about the center of the rear wheel. To each side of the frame, near the saddle, is pivoted the upper end of an air pump, a flexible tube from which leads to the motor, while the lower end of the piston rod, at its junction with the pedal, is jointed to a swinging arm which vibrates about a rear coupling pivoted to the frame, the pump cylinders also swinging about their pivotal connections with the frame at their upper ends.

BICYCLE HANDLE BAR.—Joseph D. King, Menominee, Mich. To facilitate adjusting the handle bars of a machine to suit the convenience of the rider, and locking them in such position against accidental release and change, a construction is provided by this invention according to which an annulus at the upper end of the stem has interior locking teeth adapted to be engaged by dogs, in connection with a thimble and interior tube connected with the two handle bars, the dogs being attached to toggle links from which a connection extends to a spring-pressed thumb lever on one of the handle bars. The handle bars may be readily adjusted when the machine is in motion.

BICYCLE TOE CLIP.—Samuel Halligan, Perth Amboy, N. J. This invention provides a pedal clip in which a body portion connected with the return section is weighted, there being means for conveniently adjusting the clip on the pedal. When the clip is in position on the pedal it automatically assumes and maintains a horizontal balanced position, enabling the rider to quickly locate the toe in the clip, and the entire device is simple and inexpensive.

Mechanical.

RATCHET DRILL.—Jacob Racich, New York City. The mechanism of this drill is adapted to rotate the drill while the handle is being moved in either direction, and is of greater power than that ordinarily employed. An operating lever is pivoted at one side of the axis of the drill, double pawls being pivoted on opposite sides of the center line of the lever, threaded sleeves engaging the drill socket and a back pressure foot, and a toothed feed wheel being connected to the latter. A telescopic rod is connected to the handle and the back pressure foot, a slotted arm being carried by the outer section of the rod, and a pawl adjustably pivoted in the slot engages the feed wheel. The drill may be set at the feed desired, considerable variation in which is provided for.

SAWING MACHINE.—Anderson W. Brown and James Meiklejohn, Rhinelander, Wis. These inventors have devised a machine designed for sawing down trees and for sawing the logs into desired lengths. The saw carrying frame is adapted to swing on the bearings for the operating shaft, which may be rotated by hand or other power, such shaft standing vertically to saw down a tree and the saw being formed of sprocket links constituting an endless saw passing over sprocket wheels carried by the frame. The saw being held horizontally, the forward run cuts into the tree, the feeding being effected by swinging the frame inward, while to cut a felled tree into lengths the frame is swung downward to bring the lower run of the saw into engagement with the log.

SQUARE, PLUMB AND LEVEL.—William Moore, Long Island City, N. Y. This is a combination tool for the use of bricklayers and masons, the tool being so constructed that it is possible to use it upon work which is out of the perpendicular, for leveling purposes, it being provided that an arm may be projected from the body of the tool at any desired angle and held in the position to which it is adjusted, the arm, together with the body of the tool, when one is at right angles to the other, constituting a regular carpenter's square.

PIPE COUPLING.—Edward J. Mallen, New York City. For pipes having flat sides, more especially, this coupling is designed to firmly connect the ends of the pipe sections to form a stiff airtight joint and give an ornamental appearance to the pipe. The invention consists principally of a strip of sheet metal having near its middle a pocket for the reception of a filling, preferably of wood, the ends of the strip being adapted to be engaged by the sides of the pipe and the inner sides of the pockets, which form receiving grooves for the ends of the pipe to be jointed.

Miscellaneous.

LITHOGRAPHIC COLOR PRINTING.—Louis C. G. Lesage, Paris, France. In order to facilitate

the reproduction of pictures uniformly representing the exact colors and shades desired, the compound colors being produced by the superposition of primitive colors, when impressions are taken from two or three plates, this inventor has devised a novel color chart, in which the lithographer may always find the tones or shades of the design or sketch required, and a machine capable of preparing the plate in accordance with the chosen tones or shades. The electrically-controlled marking tool of the machine produces dots at regularly graduated distances from each other, the dots being more or less close together on the different stones, according to the shade desired to be produced by the different impressions, the shades being accurately determined by the chart, and the results being always certain and uniform.

MANUFACTURING CALCIUM ACETATE.—Martin F. Quinn, Straight, Pa. A simple apparatus by means of which the process of manufacture may be carried on at a comparatively small cost is provided by this inventor. It comprises a shell for the lime as received from the retort, the shell having a pitched roof with outlet for alcohol fumes, a trough at the junction of the walls and roof of the shell, a steam heating coil close to the inner surface of the side and end walls, and a steam jacket over the entire area of the bottom of the shell. The whole operation of separating alcohol from acetate of lime and preparing the lime for the kiln is completed in this one apparatus, thus saving handling, wastage and labor. The same inventor has obtained a further patent for a kiln for drying acetate of lime and making it ready for market. It has side and end walls, with troughs extended along the upper portions of the side walls, a trough or pipe receiving the discharge from the troughs, and a water spraying pipe extended along the apex of the roof, there being track rails in the kiln and steam heating pipes in its lower portion. With this construction lime once in the kiln may be quickly treated and placed upon cars without further work on the part of the attendant.

WHEELED VEHICLE.—Horatio B. Osgood, Binghamton, N. Y. To provide stronger and cheaper axles for heavy vehicles, such as trucks and skids, is the object of this invention, the vehicle being provided with a frame having projecting lugs, one face of each lug being convex, while the metal axles for the frame have in one end of each axle a depression formed by swaging to expand the end of the axle, the depressed and expanded ends of the axles being respectively cast into the lugs so that the axles will project perpendicularly from the convex faces of the lugs.

BARREL FILLING MACHINE.—Joseph E. J. Goodlett, Memphis, Tenn. This invention covers an improvement on a former patented invention of the same inventor, according to which a conducting tube with universal joint or coupling is attached to a valve and float mechanism attached to a gooseneck, the gooseneck and valve chamber being, according to the present invention, formed integrally and the valve chamber shortened, thus reducing the cost of manufacture. By providing a plug and shell or plug casing for each tank, the filler may be readily changed from one tank to another, thus saving time and labor as compared with filling apparatus having joints or couplings of ordinary construction.

PORTABLE FIRE EXTINGUISHER.—Clotilde F. B. Durand, Montreal, Canada. In extinguishers adapted to eject a saline solution by the pressure of a gas with which the extinguisher is charged, this invention provides a novel construction and arrangement of a lever in connection with the discharge nozzle and valve. The extinguisher is of glass, resembling an ordinary ginger ale bottle, with screw-threaded neck for the attachment of a metal head with lateral discharge nozzle, there being in the head a valve operated by a curved lever, which may be pulled back by the finger, the body of the extinguisher being held by the other hand.

CURTAIN ROLLER ATTACHMENT.—Martin L. Kullberg, Brooklyn, N. Y. This invention provides a superior curtain support comprising a pole with central bore, slotted radially, a plug having a knob at each end of the pole and a feather on each knob, the feathers fitting in the ends of the slot. Nails engage the plugs to hold the knobs in position, and a wire is secured to a cylindrical block slidable in the bore, the end portions of the wire extending through the slot, one end terminating with an eye and the other end having a spring-pin, the curtain being attached to the pin.

ADJUSTABLE SIGN AND FRAME.—Alvah C. Roebuck, Chicago, Ill. This is a device for use as a name plate or for other purposes, the frame being adapted to hold a long or short name or any reading matter required for display. The frame is simple, inexpensive, and may be applied to any surface, and consists of side pieces grooved on their inner edges, caps receiving the ends of the side pieces and engaging their grooves, each of the caps having a grooved projection on its inner face, while a back plate engages the grooves of the projections.

FISHING ROD REEL HOLDER.—Daniel L. Andrews, Webster, Mass. In this holder clamping bands are provided with adjustable clamps or tightening devices, in connection with a slide adapted for attachment to a reel adjustably carried by the clamps, affording a rigid and firm contact between the reel holder and rod, and providing for an adjustment of the reel upon its holder and the adjustment of the holder upon a rod, so that when the holder is clamped upon a rod the reel will be simultaneously locked in position on the holder.

RAT AND MICE TRAP.—Theodore H. Bradish, Utica, N. Y. Instead of killing or imprisoning rats and mice, in what the inventor styles the present "cruel and inhuman" way, this trap is designed, when the animal enters the trap and approaches the bait, to release an elastic, held around the opening of the trap, the elastic then closing about the body of the rat. Attached to the elastic are bells and tufts of cotton or other material, painted or coated with phosphorescent material, etc., it being designed that the escaping rat shall thus effectually frighten away other rats.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

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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.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(7318) F. S. G. asks: How many 5 × 7 Crowfoot gravity batteries should I use on a 350 feet long telegraph line with two 5 ohm instruments and ground return? Line made of No. 12 galvanized iron wire. A. Two cells should be sufficient for this line.

(7319) E. E. G. writes: I would like a little information in regard to the Mesco dry battery. 1. Is the dry battery considered to be as good as the liquid for operating small call bells? A. Dry cells are useful because of their cleanliness and convenience, but they do not generally give as strong a current as a wet cell of the same materials. 2. How many cells of dry battery are required to ring a 4 inch bell through 100 feet of No. 18 wire? A. It would be advisable to use two cells, though one fresh cell would probably ring the bell. 3. What do you consider is the best liquid battery, the cheapest to keep running, the least liable to get out of order, of the open circuit kind? A. There are many forms of Leclanche cells about equally good. 4. How long will the dry battery last with ordinary usage on a call bell? A. Many months. 5. Please give me the number of cells required to ring the different sizes of bells, that is, from 2½ inches to 6 inches? A. The size of the bell has nothing to do with the question. The resistance of the wire in the electromagnet is the quantity to be considered. 6. Does it make any difference in regard to the number of feet of wire used, that is, if I use more wire, will it require more cells of battery? A. Yes. 7. I intend to build a telephone line one mile in length to use three instruments; as I am not very well posted in the telephone business, do not hardly know what I want. What size wire shall I need? Will No. 14 be large enough? A. Use No. 12 galvanized iron wire. 8. Could I not have the call bell on the telephones work with a push button? A. Yes. 9. How many cells of battery will be required? A. Two at each end. See Lockwood's "Practical Information for Telephonists," price $1 by mail.

(7320) C. D. W. asks (1) how large a storage battery it would require to maintain a current sufficient to run seven 16 candle power incandescent lamps at 110 volts for 6 hours. A. 55 cells in series will give the voltage required. The seven lamps require about 3¾ amperes. This will be given by type C of the chloride cells, with 7 plates per cell, each 4×4⅜. They will discharge at this rate for ten hours. 2. Could this battery be charged through the same transformers as are used for the house circuit? A. No. A direct current must be used to charge them. 3. How long and how many watts would it take to charge the above? A. The time required for recharging depends on the amperes used at 110 volts. The ampere hours of the cell are 37½. If 10 amperes are used in recharging, it would require 3¾ hours.

(7321) McL. P. says: A peddler recently passed through our city selling a compound of such a nature that when it was applied to a newspaper cut, colored or black, and a clean piece of paper placed upon it and heat or friction applied, the cut would be faithfully transferred to the clean paper. The compound had the appearance of an emulsion, being milk white and smelled strongly of turpentine. Can you give us its formula? A. Information on this subject, also formulas for the preparations for effecting the transfers are contained in SUPPLEMENT, Nos. 1062, 1122 and 1141, price 10 cents each by mail.

(7322) J. J. W. asks: Will you kindly inform me through your Notes and Queries of the SCIENTIFIC AMERICAN how to make a good black indelible ink, such as is used in marking and designing on linen and other goods and such that will not spread? A. See formula in SUPPLEMENT, No. 1121, price 10 cents by mail.

(7323) J. M. R. writes: Please inform me through your Notes and Queries how to make black ink like that sold in all stationery stores. A. See formulas in SUPPLEMENT, Nos. 157, 1119 and 1139, price 10 cents by mail.

(7324) A. W. B. asks for a formula for a roach food—one that will kill or drive away the roach and be absolutely harmless to human beings. The reason I want a roach food that kills is this: I have tried the various insect powders on the market, with no good results. A. Some years ago we analyzed a commercial roach food, and found it was composed of 90 per cent. borax and 10 per cent corn starch. The powder was colored with a little carmine. This is considered to make a very efficacious roach food. It would not be poisonous to a human being.

(7325) W. R., Eureka, Cal., asks: 1. Which bullet travels through more space—that fired perpendicularly upward, ascent and descent both included as distance traveled; or, one fired at any acute angle of elevation? A. A ball fired at 45° elevation is supposed to have the longest trajectory. 2. By which of the six mechanical powers can the same power overcome the greatest weight or resistance? A. The usually termed mechanical powers are the lever, the inclined plane, the screw, the wheel and axle, the wedge and the pulley. The one that has the least friction is the most efficient. This applies to the lever.

NEW BOOKS, ETC.

MECHANICAL DRAFT. A practical treatise. Boston, Mass.: B. F. Sturtevant. 1898. Pp. 385.

The subject of mechanical draught has been discussed at greater or less length in the technical press and before various engineering societies, but in all cases such discussion has been distinctly limited. Here for the first time the attempt is made to give the treatment its importance demands. Although its introduction is an evidence of a somewhat radical departure in certain features of boiler practice, yet extended and recent experience clearly indicates the permanence of this departure. Though published by a firm which has been prominently before the engineering world for many years as manufacturers of fans and blowers, still the work will prove of great value to all mechanical engineers, as it is filled with data and is well illustrated by diagrams and engravings, many of the latter being from plans which are in actual use.

THE TRAINING OF A CRAFTSMAN. By Fred Miller. New York: Truslove & Comba. 1898. Pp. 249, 161 illustrations. Price $2.

This book is the outcome of a series of articles contributed to the Art Journal. The author's object is to bring to the notice of the reader, through the medium of illustrations, the work of some few representative craftsmen, with a few personal notes, the results of conversations with the craftsmen themselves, and also a general survey of the work being done to-day in some of the leading crafts. "Crafts" is an ugly word, but it is a very expressive one, and the beautiful examples of modern work which are given in the present book indicate what is now being done by workers who apply art to industry.

A SYSTEM OF EASY LETTERING. By J. Howard Cromwell, Ph.B. New York: Spon & Chamberlain. 1897. Pp. 68. Price 50 cents.

This is an admirable system of lettering, drawings and signs. We have but to divide any surface which we may wish to letter into squares or parallelograms, as the case may be, in pencil lines; form the required letters in ink or paint according to the style chosen, then erase the pencil lines, and the lettering is complete.

SUGGESTIONS FOR LABORATORY AND FIELD WORK IN HIGH SCHOOL GEOLOGY. Questions for use with Tarr's Elementary Geology. By Ralph S. Tarr. New York: The Macmillan Company. 1897. Pp. 100. Price 25 cents.

This little pamphlet gives valuable advice to the professor of geology as to taking students out on field expeditions and for work in the laboratory. It also contains questions for use with Tarr's Elementary Geology.

THE ROAD TO PROSPERITY. A treatise on political economy. Written upon various subjects, with a view of aiding in creating permanent prosperity and contentment of the people. By T. W. Wood. Chicago: Charles H. Kerr & Company. 1898. Pp. 78. Price 25 cents.

UNITED STATES DEPARTMENT OF AGRICULTURE. Weather Bureau Bulletin E. Floods of the Mississippi River. By Park Morrill. Washington. 1897. Pp. 58.

The present work attests the great value and thoroughness of the work accomplished by the Weather Bureau with the crippled means at their disposal, to which we have already referred. The large pamphlet is filled with interesting matter relating to the drainage basin of the Mississippi River, both under normal and flood conditions. The floods occurring during the past twenty-six years are made the chief subject of study, inasmuch as only during that time complete and reliable gage readings were available. Six notable flood years are included in this period, and for these six flood hydrographs have been drawn for several typical stations. The downflow of water from which each flood arose has been computed and the results are given in tabular form. The 58 maps and charts are well executed.

STEWART'S TELEGRAPHIC CODE. By means of which any number, from one to a million, can be expressed by a single word of not more than ten letters. By Charles Stewart. Saint Paul. 1897. Pp. 22 Price 25 cents.

This little book gives a convenient system for transmitting numbers by telegraph, and will undoubtedly prove useful to those who use telegraph codes.

MATHEMATICS. LOGARITHMS: THEIR NATURE, COMPUTATION AND USES, WITH LOGARITHMIC TABLES OF NUMBERS AND CIRCULAR FUNCTIONS TO TEN PLACES OF DECIMALS. By W. W. Duffield, Superintendent. Treasury Department, U. S. Coast and Geodetic Survey. Part 1. Appendix No. 12. Report for 1896. Washington. 1897. Pp. 327.

The present work, by the late superintendent of the United States Coast and Geodetic Survey, has been very severely criticised by the lay and scientific press. The tables will prove very useful to those who do not have access to Baron Von Vega's work on the same subject. The latter work has been corrected of all known errors, and it was reproduced in 1889, in Florence, Italy, by photo-zincography, which avoided the introduction of any more typographical errors.

A MANUAL OF MENTAL SCIENCE FOR TEACHERS AND PUPILS. Childhood: Its Character and Culture. By Jessie A. Fowler. New York: Fowler & Wells Company. Pp. 235. Price $1.

MIT SCHLÄGEL UND EISEN. By Dr. Wilhelm Bersch. Vienna, Pesth and Leipzig: A. Hartleben. Twenty-five parts of 32 pages each, at the price of 30 kr. (15 cents) per part, or $3.75 for the whole work.

It presents, in a popular way, all the subjects that pertain to mines and mining, such as geology, mineralogy, constructions, tools and machines used in mining, and the methods and apparatus for treating ores and other mining products. The book is illustrated by more than 300 cuts and 26 full page engravings. The paper, type and general get-up of the work are excellent, and the book will be similar in size and style to the popular works on electricity, railway construction and general scientific subjects issued by the same publishers.

We have received the Christmas number of the Northwestern Miller, and it is a remarkable specimen of trade journalism. The cover of the number is embossed in imitation of old ivory, representing Don Quixote making his fierce attack on the windmill of the Manchean plain. There is a colored frontispiece showing milling among the cliff dwellers of Arizona. Various articles in the number are contributed by such writers as Mary Halleck Foote, Octave Thanet, Bill Nye, Edward Everett Hale and others. Many of the illustrations are in color and the half-tones are superbly printed. There is also a map showing the winter and spring wheat sections of the United States, with valuable statistics. The holiday number is mailed by the publishers, from Minneapolis, for fifty cents.

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JANUARY 11, 1898,

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Color specimens to sample sheets, apparatus for attaching, C. D. Bradt 596,977
Comb and pen or pencil holder, combined, E. H. Norton 597,121
Combing machine, wool, E. Lodge 597,361
Compass, marine recording, Heinrich & Wood 597,166
Condensing fumes, vapors, etc., apparatus for, A. E. Griffiths 596,996
Conveyer, G. B. Krug 597,376
Cooking utensil, B. Loery 597,217
Coop, chicken, W. A. Douglass 597,214
Coupling. See Pipe coupling.
Cradle, self rocking, F. B. Millard 597,168
Cutter. See Stalk cutter.
Cutter guide, E. J. Miller 597,013
Cylinder heads, device for removing, G. W. Bissett 597,136
Dental grindstones, wetter and wiper for, O. B. Brann 597,235
Desk lid hinge and support, combined, F. W. Tobey 597,309
Ditches, self clearing screen for, N. Lamb 597,241
Door roller attachment, sliding, D. W. Tower 597,310
Dough for bread making, etc., machine for dividing, C. E. & J. E. Pointon 597,089
Dough or like material, machine for moulding, C. E. & J. E. Pointon 597,088
Draught equalizer, A. Lange 597,290
Dredging machine, H. K. Reynolds 597,190
Drier. See Fruit drier.
Drill. See Rail drill.
Duplex engine, A. J. Caldwell 596,981
Duster, J. P. Willey 597,158
Elbow, sheet metal, F. Dieckmann 597,056
Electric generator, static induction, A. L. Bogart 597,137
Electric machine, dynamo, J. Sohlman 597,090
Electric motor controller, C. S. Cook 597,265
Electric motors, regulating speed of series, H. F. Parshall 597,018
Electric switches and extinguishing sparks thereof, means for operating, J. B. Knudsen 597,150
Electric transformer, J. F. Gates 597,180
Elevator. See Hay or grain elevator.
Elevator guide lubricator, M. Abt 597,251
Embroidery frame, N. C. Leonard 597,007
Engine. See Duplex engine. Gas engine. Rotary engine.
Engines, automatic stopping mechanism for, V. E. Hunter 597,198
Engravings, producing, B. F. B. Fagg 597,277
Excavating and back filling apparatus for sewers, etc., combined, D. I. Calhoun 597,312
Farm gate, G. H. Mott 597,169
Fender. See Car fender. Hay rake fender.
Filter, C. H. Rhood 597,248
Filter press, P. R. Gray, Jr 596,995
Filtering device, C. H. Rhood 597,222
Filtration under pressure, apparatus for, P. R. Gray, Jr 596,994
Fire alarm, G. A. Townsend 597,128
Fire hose nozzle, M. H. Hart 597,182
Fireman's apparatus for handling ladders at fires, C. E. Rice 597,022
Fireproof buildings, construction of, A. H. Van der Vygh et al 597,039
Fireproof wall plates, etc., composition of matter for, A. H. Van der Vygh et al 597,129
Fish hook, F. Eder 597,142
Floor oiling and rubbing appliance, A. F. Pratt 597,246
Fluid meter, rotary, W. H. Marsh 597,066
Fluid pressure regulator, J. W. Weeks 597,250
Folding box, H. A. Loverin 597,065
Fruit drier, A. H. Blackburn 597,257
Fruit gatherer, D. T. Ward, Jr 597,340
Fruit jar and cover for same, A. W. Mallo 597,083
Funnel, P. Anders 596,972
Furnace. See Boiler furnace. Hot air furnace.
Furnace, G. D. Hoffman 597,284
Furnace grate, F. Evans 597,079
Furniture, portable, S. A. Dane 597,050
Gage. See Micrometer depth gage. Railway track gage.
Game carrier, M. H. Parker 597,016
Gas and electric light fixture, combination, J. W. Parkin 597,244
Gas and oil from water, device for separating, M. W. Bovee 597,258
Gas apparatus, acetylene, J. Leede 597,291
Gas burner, E. T. Jones 597,319
Gas burner, acetylene, E. J. Dolan 597,057
Gas burner, incandescent, D. Meyer 597,011
Gas engine, C. Quast 597,326
Gases, vessel for containing liquid, C. Schmitz 597,024
Gate. See Automatic gate. Farm gate.
Gate, O. Honegger 597,285
Generator. See Electric generator.
Gilders' leaf and making same, O. Michalk 597,012
Gloves, etc., fastener for, M. Wertheimer 597,132
Gold collecting plates, composition of matter for, C. E. Greene 597,113
Grinding machine, C. F. Tebbetts 597,033
Gun carriage recoil check, field, C. Rostel 597,126
Gun mount, C. O. Forsell 597,178
Hammock, H. Thiele 597,227
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Harrow, Lean & Fisher 597,201
Harvester and husker, corn, J. W. Warrick 597,041
Hay or grain elevator and distributer, C. D. Beckwith 597,096
Hay rake fender, horse, W. Ostrander 597,170
Hay rake, horse, D. B. Smith 597,072
Head rest, pocket folding, N. R. Stone 597,336
Heater. See Peanut heater. Water heater.
Heddle, L. Knecht 597,149
Hook. See Fish hook. Whiffletree hook.
Horse detacher, J. P. Ponton 597,363
Horseshoeing apparatus, F. Ellsworth 597,317
Hose cleaner, W. A. Huebner 597,185
Hose reel, E. Cliff 597,100
Hot air furnace, L. Steelman 597,091
Hub attaching device, S. Day 597,315
Hydrocarbon burner, G. E. Haggerty 597,197
Incubator, J. L. Nix 597,242
Indicator. See Speed indicator.
Injector, L. Ahrbecker 597,212
Insect exterminator, C. J. Stewart 597,032
Insulating trolley hanger, E. J. Cook 597,140
Ironing machine, W. P. Lynch 597,322
Jack. See Vehicle jack.
Jar. See Fruit jar. Self sealing jar.
Jar closure, J. Schies 597,299
Joint. See Railway rail joint.
Keyless lock, W. B. Holton 597,080
Knitting machine, G. F. Sturgess 597,092
Knitting machine, circular, Ingalls & Baron 597,288
Lace, ribbon, or belt reel, J. A. Dowdy 596,988
Lamp chimney cleaner, S. Larson 597,187
Lamp filament, incandescent, E. F. Von Wilmowsky 597,172
Lamp post attachment, A. Wehr 597,343
Lantern, Baron & Haffey 597,254
Lasting machine, S. W. Ladd 597,321
Lasting machine, A. F. Preston 597,247
Latch and stop, combined door, G. D. Pettingell 597,219
Latch lock, V. Watrous 597,341
Lathe and attachment, E. L. Striegler 597,303
Lifter. See Barrel lifter.
Liquid fuel burner, L. Serpollet 597,028
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Liquids from vessels, apparatus for withdrawing, Lindner & Ziegenbein 597,292
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Lock, T. L. Richardson 597,021
Loom picker check, R. Thackery 597,192
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Lubricator, P. J. Donohue 597,371
Lubricator, A. M. Way 597,157
Luggage carrier, A. H. Jenks 597,318
Mail box, E. E. Foss 597,179
Mail collection system, D. A. Gray 596,993
Mandolin, G. W. Bostwick et al 597,352
Match box, bicycle, H. Frank 597,279
Mattress, ventilated, P. Forsberg 597,053
Mechanical movement, H. Kramme 597,200
Metal planer feed, Gray & Richter 597,355, 597,356
Metals, separating and refining, F. R. Carpenter 597,139
Meter. See Fluid meter.
Micrometer depth gage, F. Spalding 597,335
Mines, air door for coal, Holbrook & Harding 597,147
Mining machine, E. L. Hopkins 597,358
Mining machine, E. C. Morgan 597,085
Mirror pivot and adjuster, F. W. Tobey 597,308
Moistener, envelope, S. S. Marley 597,010
Mordanting, C. Dreher 597,107
Motocycle, L. H. Wattles 597,042
Motor. See Railway motor.
Mower, lawn, L. H. Davis 596,985
Nailing machine, W. B. Brady 597,097
Needle case, Kramer & Cartter 597,004
Needle threader, A. L. McLaren 597,086
Nut and bolt lock and washer, combined, J. A. Lombas 597,293
Nut lock, W. Buffington 597,260
Nut lock, D. Mitchell 597,119
Nut lock, Norlund & Clark 597,218
Nut lock, J. P. Peck 597,324
Package, sealed, O. S. Fellows 597,109
Packing composition, steam, F. E. Hall 597,357
Pad. See Pneumatic pad.
Pad holder, E. G. Tebbutt 597,034, 597,035
Pail, J. Danz, 2d 597,051
Paper cutter clamp coupling device, C. Seybold 597,069
Paper cutter hand clamp, C. Seybold 597,070
Paper fixture, toilet, E. B. Weston 597,231
Paper packages, supporting device for toilet, E. B. Weston 597,230
Paper weight and pencil sharpener, combined, G. W. Beebe 597,370
Peanut heater, T. M. Walker 597,210
Pen, electric searing, H. Green 597,373
Pencil holder, O. R. Pihl 597,295
Pianoforte, J. A. Weser 597,044
Pipe and bolt threading machine, hand, J. F. Crudginton 596,983
Pipe coupling, train, W. I. Cunningham et al 597,267
Placket fastener, I. N. Weitzel 597,131
Planter, automatic check row corn, R. V. Barry 597,193
Planter check row attachment, seed, H. W. Deutscher 597,353
Planter, corn, J. H. Acton 596,971
Planter, seed, J. H. Haley 596,997
Plaster board, process of and machine for making, E. C. Smith 597,332
Plastic composition from cork, etc., producing, M. Hocquet 597,283
Plow, double shovel, C. B. Williams 597,045
Pneumatic dispatch tube systems, terminal for, L. C. Bostedo 597,138
Pneumatic pad for bicycle or like handles, Elton & Smith 597,108
Powder dividing, T. H. Nance 597,188
Power. See Wave power.
Precipitating safe, Donohue & Corker 597,372
Press. See Baling press. Filter press.
Primary battery, C. J. & H. C. Hubbell 597,239
Printing plates, preparing aluminum, O. C. Strecker 597,366
Printing press sheet delivery mechanism, R. W. Jamieson 597,114
Pulley or sheave, J. Kibin 597,063
Pulp grinding machine, wood, A. Tromblee 597,208
Pump, M. D. Temple 597,155
Pump, C. C. Worthington 597,368
Pump, C. A. Wright 597,076
Pump, air lift, W. L. Saunders 597,023
Pumps and hose to strainers, device for attaching force, J. T. Brady 597,259
Purse, E. L. Prickett 597,325
Pyroxylin compound, H. Goetter 597,144
Rack. See Car hay rack.
Radiator foot rest, E. W. Cornell 597,049
Rail drill, M. M. Moore 597,377
Railway conduit system, electric, R. F. Thomson 597,036
Railway, electric, H. W. Libbey 597,202
Railway motor, electric, C. J. Van Depoele 597,156
Railway rail joint, E. C. Edwards 597,271
Railway tie plate, W. E. Miller 597,084
Railway track gage, D. Sweeney 597,305
Railway vehicles, current collecting means for electric, C. A. Terry 597,306
Ratchet wrench, E. C. Webster 597,043
Reel. See Hose reel. Lace, ribbon or belt reel.
Reflector, lamp, J. S. Thomas 597,307
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Reversing mechanism, G. Busch 597,311
Rheostat, graphite, E. W. Jewell 597,002
Rotary engine, C. Engberg 597,274
Rule, jointed, E. Chabot 597,261
Sack filling and sewing machine, A. T. Timewell 597,075
Sander cylinders, paper fastening for, M. A. Beck 597,048
Sash lift and fastener, K. A. Klose 597,199
Saw, T. L. Wallace 597,229
Saw handle, E. C. Atkins 597,351
Scaffold, Rue & Devine 597,205
Scale, joint measuring, O. Schubert 597,330
Scale, price, A. U. Smith 597,300
Screen, D. E. Phillips 597,245
Screw union or coupling, C. A. Higbee 597,000
Seating, depot, C. B. Demarest 596,986
Seed delinter, cotton, J. S. Rosamond 597,123, 597,124
Seed delinting machine, cotton, W. A. Ragsdale 597,327
Seed delinting machine, cotton, F. E. Rosamond 597,125
Self-measuring tank, A. W. Krause 597,116
Self-sealing jar or vessel, W. D. McLaughlin 597,014
Self-setting trap, F. W. Frampton 596,990
Separator. See Centrifugal separator. Steam separator.
Sewing machine, H. R. Tracy 597,338
Shade roller fixture, E. C. Eyl 597,354
Shafts in hubs or couplings, device for locking, P. H. Rylander 597,329
Shelving, library, D. E. Hunter 597,186
Shirt, G. D. Eighmie 597,215
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Signal apparatus, coin-actuated, H. R. Mason 597,362
Signaling shutter, F. G. W. J. Adams 597,134
Silver ores, chloridizing, E. Heiligendorfer 597,238
Skate, roller, S. L. Schwartz 597,025
Skate sharpener, H. W. B. Gowdy 597,163
Skirt facings, machine for making, A. C. Squires 597,074
Skirt protector, bicycle, A. Ross 597,298
Smelting, method of and apparatus for matte or pyritic, O. S. Garretson 596,991
Socket bracket for drapery poles, etc., J. C. Larkins 597,064
Soldering aluminum, F. A. Gooch 597,111
Soldering aluminum, flux for, F. A. Gooch 597,112
Speed indicator and cyclometer, combined, W. J. Edwards 597,272
Spice box, E. Ackermann 597,077
Spikes, bolts, etc., device for drawing, V. R. Paige 597,294
Spinning machine lubricating device, L. Shepard 597,331
Spinning machine ring and traveler, F. S. Culver 597,176
Spinning mule driving mechanism, J. A. Aubry 597,234
Spittoon, fountain, G. E. Johnson 597,359
Spool, L. N. Parks 597,017
Spoon holder, J. T. Cassino 596,982
Spring. See Vehicle spring.
Spring shackle, vehicle, H. C. Swan 597,225
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Stacker, Erickson & Johnson 597,275
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