SCIENTIFIC AMERICAN

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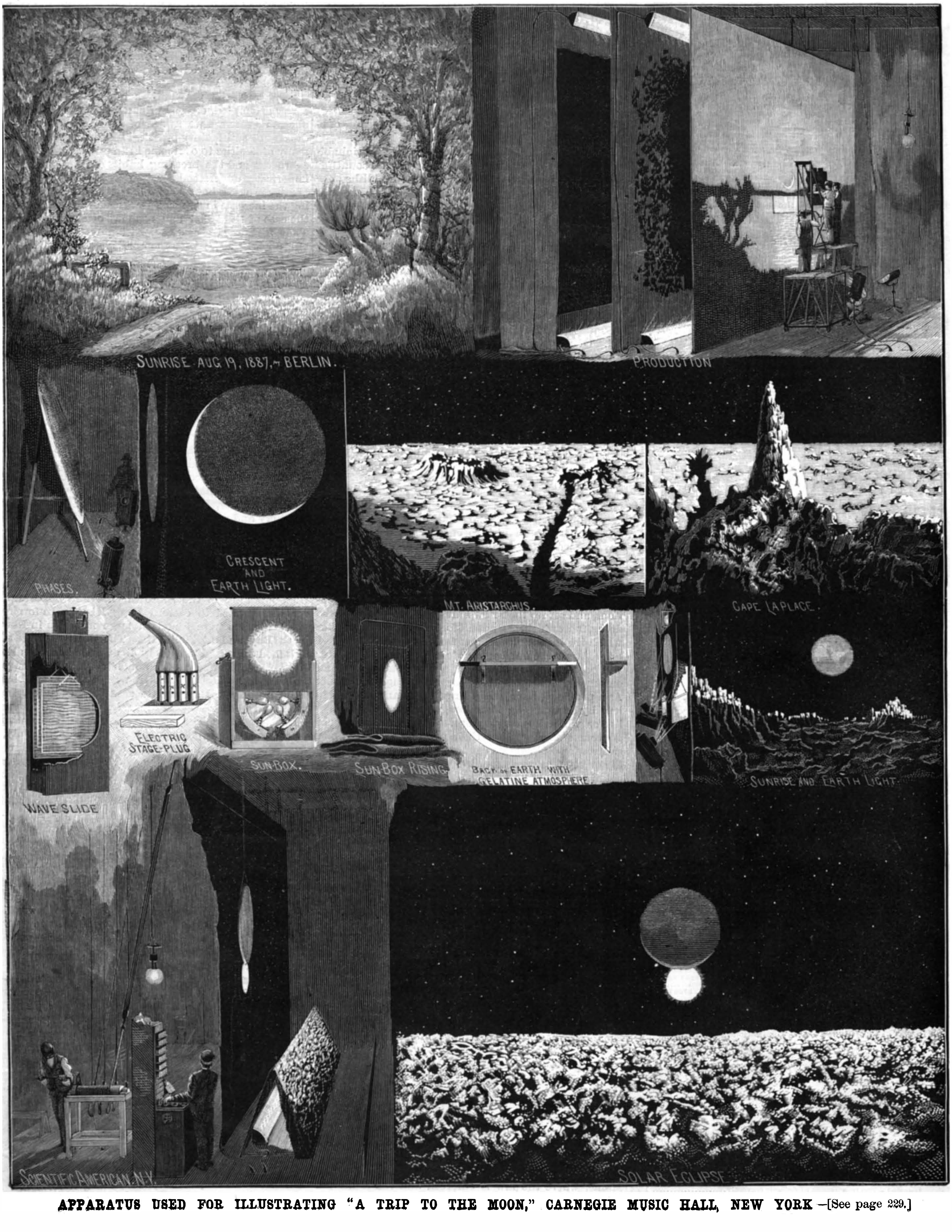

APPARATUS USED FOR ILLUSTRATING "A TRIP TO THE MOON," CARNEGIE MUSIC HALL, NEW YORK.—[See page 229.]

Scientific American.

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NEW YORK, SATURDAY, APRIL 9, 1892.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 849.

For the Week Ending April 9, 1892.

Price 10 cents. For sale by all newsdealers.

PROPOSED DISCRIMINATION AGAINST FOREIGN INVENTORS.

A dispatch from Washington says, at the request of the House Committee on Patents, General Berdan has prepared and submitted to the committee a bill to equalize the cost of patents to inventors in the United States and in foreign countries. In an argument before the committee General Berdan said that in England a patent costs about $800, and runs fourteen years, while in this country a patent can be had for $35, and runs for seventeen years. General Berdan said that many English inventors took out patents in this country, as well as at home, and he asserted that they should be charged the same for taking out a patent in the United States that it costs them in England. The bill, it is said, was favorably received by the committee.

The idea of compelling Englishmen to pay more for patents in this country than our own citizens, because the British fees for patents are larger than ours, is very old. Under the law of 1836 and up to the year 1861, the subjects of Great Britain were required to pay $500 on filing an application for an American patent, and all other foreigners $300. If the application was rejected, two-thirds of the sum paid was refunded and one-third retained by our government.

In 1861 this law discriminating between the inhabitants of the United States and those of other countries was repealed, and the same fees were established for all applicants, namely, $15 on filing the application for patent and $20 payable in the event of an allowance of the patent. If no patent is allowed, the applicant loses the first fee of $15, which is supposed to cover the cost of the official examination.

Prior to the year 1861, the number of patents granted to Englishmen was quite small, varying from twelve to twenty patents in a year. Dating from the reduction of fees in 1861 to the present time, the yearly number of patents to Englishmen has gradually increased. In 1880 the number issued to them was 275; in 1890, it was 721. Of all foreigners, the English take the largest number. Germany comes next, with 452 granted in 1890; Canada, 371; France, 178; Austria, 71; Switzerland, 56; Sweden, 32; very few to other countries.

The total number of American patents issued in 1891 was 23,244. It will thus be seen that the ratio between patents granted to Englishmen and other foreigners, as compared with the total number of issued patents, is very small. Whether it is desirable to return to the old, abandoned system of discriminating against foreigners is very questionable.

The theory upon which we grant patents, and the object of our patent laws, is the promotion of useful arts and industries, not the taxation of inventors. The aim of our patent law is to encourage the study and development of new inventions whereby multiplied and diversified forms of novel industries are made accessible to the people; for by industry they thrive. The American law, as it stands, invites inventors throughout the world to bring hither their new inventions, and set up their new industries; in reward for so doing, it grants them a patent for seventeen years, after which the invention becomes free to the public.

The larger the number of patents granted, the greater will be the number of new industries established, and our measure of prosperity correspondingly increased. As a people we have everything to gain and nothing to lose by encouraging inventors, no matter where they live or where they were born. The price that other governments charge for their patents may be proper subject for diplomatic negotiation; but it has no bearing or concern with the industrial laws of our own country.

The proposed bill we regard as unnecessary and uncalled for. It is unwise. It is legislation for the repression of industry and inventive genius. Nations that are so short-sighted as to adopt such measures undoubtedly subject themselves to industrial losses. They are not examples for the United States to follow.

ARTIFICIAL PROPAGATION OF LOBSTERS.

During the past ten years there has been a great falling off in the supply of lobsters, until the price has increased fully one hundred per cent. This applies alike to the New York market, to the waters along the New England coast and in Canada and Newfoundland, where lobster fishing and canning is an important industry. The necessity for increasing the supply of lobsters is generally recognized, and two methods are proposed for accomplishing this object. One is the enactment of laws which will check the depletion of the lobster beds by over fishing and the other is artificial propagation.

Marshall McDonald, who is at the head of the United States Fish Commission, says: "I have always felt that the maintenance of the lobster fishery rested more essentially upon proper regulation of the matter by the States than upon any efforts in the way of artificial propagation. The most usual regulation is that prohibiting the sale of lobsters below certain dimensions; the minimum limit, though varying with the different States, being smallest in Massachusetts. In Maine, where the law is enforced and the minimum fixed, I believe, at ten inches, the result has been a marked improvement in the lobster fisheries during recent years."

A law was enacted by the New York Legislature in 1880, prohibiting the taking of lobsters smaller than ten and a half inches, but it was repealed, largely, it is said, by reason of the efforts of a hotel keeper in New York City with political influence, who was determined to serve small lobsters on his table, regardless of the effect of rescinding the regulations.

The difficulty of securing legislation on this subject of enforcing the laws when they are enacted, and preventing their repeal through the efforts of persons who have no regard whatever for the consequences of their acts, compels those who desire to see the supply of this wholesome food fish kept up to look to artificial propagation as the most available method for securing the object desired.

In the volume entitled "The Fishery Industries of the United States," by G. Browne Goode and associates, the following statement is made regarding the cultivation of lobsters:

"The artificial propagation of lobsters has been rarely attempted, either in this country or in Europe, and in no case are we aware of its having been productive of satisfactory practical results. There are so many difficulties to overcome in an undertaking of this character, and the breeding habits of lobsters are so imperfectly understood, that it is not surprising that greater progress has not been made in materially aiding the increase in supplies by artificial culture, as in the case of the oyster and of many of our true fishes. That further study and persistent efforts may yet afford us the means of accomplishing so desirable an object is very probable, and is sincerely to be hoped for, in view of the apparent great decrease in the abundance of lobsters on many portions of our Atlantic coast."

Since the above opinion was expressed considerable success has been achieved in the line of artificial propagation. The United States Fish Commission's hatchery at Wood's Holl, Mass., provides about three million young lobsters each year, and these are all placed in Vineyard Sound and Buzzard's Bay, owing to the impoverishment of the species in that vicinity.

For three seasons lobsters have been hatched in small numbers at the station of the New York Commission, Cold Spring Harbor, L. I. Last season 27,700 were placed in the water at that point. The embryos are very delicate, and when lobsters are placed on ice, as many are which come to market, the embryo is generally ruined for hatching purposes.

Fred. Mather, superintendent of the Cold Spring hatchery and a man of wide experience in fish propagation, said recently that lobsters were not only decreasing in numbers, but also in size. A two pound lobster was now considered a fair average.

New York is next to the largest receiving market for lobsters in the country, yet the lobster fisheries within the boundaries of the State are not now important, and are confined to eastern Long Island. In former years lobsters were found in large numbers in New York Bay and at Hell Gate. The disappearance of this food fish is due mainly to over fishing, but also to the establishment of manufactories, which have polluted the waters. Lobsters were taken at Robins Reef, New York Bay, as late as 1879, but they were small and were not exposed for sale.

Lobsters are sold in New York during the entire year, but the demand is five times greater during July, August, and September than during any other three months of the year. The demand is the least during February and March. The consumption of lobsters at Coney Island in summer reaches 3,500 pounds a day.

The experience on the coast of Maine seems to be similar to that already stated. In 1890 twenty million of lobsters were taken, which was a falling off of five million or twenty per cent from the catch of 1888 and ten per cent from 1889. There has also been a steady decrease in the size of the fish sent to market. During 1889 and 1890 the average length of lobsters offered for sale was 10½ inches and the average weight two pounds. Ten years ago the average length was 13 inches and the weight three and one-half to four pounds. There are thirty-six factories on the coast of Maine where lobsters, sardines, herrings and mackerels are packed.

Considerable progress has been made by the Newfoundland Fisheries Commission in the way of lobster propagation. The work was taken up two years ago when the methods of the United States Fish Commission were adopted and their experience was made serviceable. A hatchery was located at Dildo Island. In the summer of 1889 4,039,000 lobster eggs were hatched, and the young lobsters planted around the head of Trinity Bay, the eggs having been obtained from lobster packing establishments in the vicinity. In prosecuting this work, Adolph Nielsen, superintendent, made the discovery that lobsters had two different times for spawning. The larger run of lobsters spawn from the middle of July till the middle of August, while the smaller and middle sized ones spawn during the latter part of October and the month of November. The commissioners make the following statement in their report regarding the importance of the artificial propagation: "A means is thus provided which, if duly put into operation, will safeguard our lobster fishery from the injury or ruin which has overtaken so many of these industries in other countries, and already threatens our own. By establishing a lobster hatchery, or more than one, in each bay, the stock of lobsters may not only be maintained, but greatly increased; and at the same time, these valuable crustaceans may be planted in waters where at present they are not found, and their culture indefinitely extended." At Placentia Bay, Newfoundland, alone, 1,200 men and women are employed in the lobster industry. Five million is the annual catch, which represents $180,000 in value. Superintendent Nielsen has constructed floating hatching boxes by the aid of which it is possible to hatch lobsters when the eggs have reached a due stage of ripeness. By this means the immense number of eggs which are usually destroyed at the canning factories can be hatched, and thus the supply of lobsters be kept up. The average number of fertilized eggs carried by a lobster in the spawning season is placed at 12,000 to 18,000. The export of lobsters from Newfoundland has grown from 25,814 pounds in 1874 to 3,360,672 pounds in 1888, and the value from $124,997 in 1880 to $472,524 in 1889.

For the year 1890 the Newfoundland Commission state that success in the artificial hatching of lobsters exceeded their most sanguine expectations. There were 432 floating incubators in use, which were distributed at fourteen different stations. The percentage of loss in the apparatus was 28, as against 49½ in 1889. The result of the season's work was 406,005,300 young lobsters hatched and planted in good condition. "In the method now employed," say the commissioners, "we have obtained an invaluable means of arresting the decline in our lobster fisheries, which in many places threatens entire extinction, and of sustaining the stock of this valuable crustacean."

The depletion of the lobster fisheries has been especially noticeable in Canada. The report of 1888 showed a decrease in the value of exports of $350,000, as compared with the previous year, although there had been an advance in the price of 25 per cent. The value of the Canadian lobster fishery in 1888 was $1,483,388; in 1886, $2,638,394; in 1885, $2,613,731.

Superintendent Nielsen, of the Newfoundland fisheries, is a native of Norway, and his success in propagating lobsters has attracted a great deal of attention. In addition to artificial propagation, he believes in a closed season, when the lobsters will have a chance to propagate.

Lobsters are the more easily exterminated because they frequent shoal water within certain well defined areas, and are therefore the more easily captured. This fact renders the artificial propagation the more important, because the exhaustion of the species is rapid and certain.

The Las Vegas Irrigation Convention.

BY H. C. HOVEY.

An expert agriculturist, in whose company we crossed the great plains intersected by the Santa Fe route, exclaimed, concerning the arid regions of the Southwest, that boundless prosperity awaited them as soon as the irrigation problem should be solved. Granted a salubrious climate, wonderful scenery and inexhaustible soil, where is the water to come from? This very question that perplexed my Minnesota friend drew a convention of about 300 representative men to the opera house at Las Vegas, in the middle of March, whom we fortunately met before they were scattered again to the corners of the Territory. We also were guests at the Montezuma hotel, on the occasion of the grand "irrigation banquet," with which their three days' meeting ended. Thus we had an opportunity not only to discuss the grave problems of political economy, but also to watch at a safe distance the fantastic mazes of Mexican dances, and to see the most brilliant society of the Southwest. It should be added that the hotel is located near the noted thermal springs to which the aborigines resorted ages ago, and is attractive alike on account of its romantic environs and its admirable management.

The Las Vegas convention met pursuant to the suggestion made by the national irrigation congress held last September in Utah. By the courtesy of Governor Prince and Col. T. B. Mills, chairman of the executive committee, we were put in full possession of the proceedings, as well as of valuable facts, some of which will doubtless interest the general public. Incidentally it may be mentioned that a prominent place in the extensive library of Col. Mills is assigned to the bound volumes of the SCIENTIFIC AMERICAN, which he regards as an able ally in the work of developing the resources of our entire country.

Few may know that throughout these arid regions are the ruins of an ancient system of irrigation, that ages ago made this wilderness blossom as the rose. The autochthons who inhabited those curious houses on cliffs and in the jaws of caverns constructed acequias on levels so admirably surveyed as to be hardly improved on by all the appliances of modern science. In the country of San Juan, and elsewhere, the prehistoric aqueducts run side by side with the government ditches, and the cement with which they were laid is as firm and hard as if it had been spread last year instead of centuries ago. The vast plateaus that were thus made fertile in an era commonly described as barbaric should certainly be redeemed anew by this age of civilization.

Irrigation is no novelty, although comparatively little has been known of it in the Eastern States, and in large portions of Europe. The fact is that, to-day, more than half mankind subsist by means of irrigation, without which they could not till the soil that now yields them ample harvests. This explains the densely peopled areas of Asia. There are said to be 1,700,000,000 acres of arid land in the United States (not including Alaska); and of this vast area fully 76,000,000 acres lie within the bounds of New Mexico, sixty per cent of which acreage is thought to be susceptible of irrigation. Mining, the lumber business, and other important factors of public welfare, are to be estimated at their full value. The same is true concerning the raising of cattle and sheep, and other branches of industry. But after all the universal cry throughout the Territory seems now to be for water, and many are of the opinion that progress will mainly depend on the answer made by science and liberal legislation. Oddly the successful experiments in irrigation have thus far been in the four corners of New Mexico, while its great central regions are yet left without the needed supply. More than fifty companies have been organized to utilize and properly distribute the waste water through these thirsty acres. It has been demonstrated that water enough flows in sixty days of each year through the valley of the Rio Grande to inundate the entire arid area to the average depth of two feet. One half of that amount, added to the average annual rainfall, will insure the perfection of all crops, making a total of 33 inches, allowing for evaporation. There are enough natural reservoirs, with a little additional outlay, to store all the water that now runs to waste. There is a single basin for such a natural reservoir, west of Albuquerque, thirteen miles long, four miles wide and a hundred feet deep. The water that might be stored between these natural banks would irrigate seventy-five miles of territory as far south as the Mexican line. That reservoir could be fed from the Rio Grande by a ditch fifty miles long. Another natural basin near Las Vegas, four miles long, two miles wide, and a hundred feet deep, could be filled from the Moro, Sapillo, and Gallinas rivers by ditches from ten to twelve miles long. There are many smaller basins scattered over the Territory. It has also been proved that great bodies of subterranean water underlie a large part of the region, which could be tapped by artesian wells. Thus it is certain that the land could be well watered throughout by the use of the proper means.

As illustrating possibilities we may refer to what has been done in the Pecos valley, where, from reservoirs (one of which is seven miles long and two miles wide) 400,000 acres are now under successful irrigation. About 100,000 acres of the great Maxwell grant and about 30,000 of the Montoya grant are irrigated. The results for last year were wonderful. The soil of the Maxwell grant is especially adapted for beet culture. But it is found desirable to restrain the growth of the crop. Beets are capable of attaining an immense size, but at the cost of sweetness. A beet that weighs three and a half pounds contains all the saccharine matter possible—all above that weight being found to diminish the proportion of sugar. By judicious irrigation Mr. Pelles, the manager of the Maxwell grant, got 15 per cent of saccharine matter from 100 weight, the average yield being 18 tons per acre. It costs but little more to raise sugar beets than corn; but the return, at the above rate, would be from $75 to $100 per acre. As the basis on which the sugar factories buy the beets is at the rate of $4.50 per ton, with 10 per cent saccharine matter, of course the yield in New Mexico, as already stated, would be proportionally more remunerative. There are in the United States seven sugar beet factories, that produced, in 1891, 27,000,000 pounds of refined sugar. In that same year we imported $90,000,000 worth of sugar. The people of New Mexico claim that that amount could be raised in their Territory alone, with irrigation, and allow a surplus for exportation. They refer also to the fact that the importation of raisins in 1891 amounted to $20,000,000; and affirm that this entire amount could be raised here with due irrigation. An arid country is needed for drying raisin grapes in the sun; for the cost of artificial drying would be too great. The profit from raisin culture is from $200 to $300 per acre, and the only parts of the United States suitable for it are Southern California, Arizona and New Mexico. In Eddy County, N. M., as the direct sequel of recent irrigation, one grower has this year planted 1,200 acres of raisin grapes. Somewhat similar statements might be made concerning the cereals, alfalfa, and all kinds of fruits.

The object in giving the foregoing facts is to explain why there is such enthusiasm in this region on a subject that elsewhere may be more safely regarded with indifference. In conversation with the governor, secretary, surveyor-general, and other officials, the opinion was most positively expressed that the future of the Southwest mainly depended on the solution of the irrigation problem. And the same conclusion was unanimously voiced by the resolutions passed at the Las Vegas convention. The settlers on the great plains have invested millions of dollars, not as speculators, but as home seekers, only to discover that the most fertile lands in the world are worthless without water. What can a farmer owning but 160 acres, or even 1,000 acres, do individually toward remedying this deficiency? Generally he is powerless. The recent laws of the United States operate to prevent the formation of great monopolies for reclaiming wide regions of arid land. The new States and Territories are hindered in many ways from developing their best resources. Most of the public domain, not yet sold or otherwise disposed of, can only be cultivated by costly canals, reservoirs or artesian wells. The mountain snow fields, the deep canons, and the raging torrents, can hardly become private property, or even the property of ordinary corporations; and yet these are the original sources of irrigation. The outlay required is so vast that the general government can hardly be expected to reconcile the more favored regions of the North and East to consent to any adequate plan. Yet fears of the complications that might arise were any other method adopted than by governmental control cause considerable opposition, on the part of some persons, to plans of a different nature and that commend themselves to the majority of those who are most deeply interested.

Every shade of sentiment was brought out at the Las Vegas convention. But after a three days' discussion a series of resolutions was adopted, with I believe but one dissenting vote, declaring in favor of having the United States cede to the States and Territories within whose boundaries are located the "arid lands," all lands of this description, on condition that each State or Territory shall at once begin the proper work of irrigation, pledging such portion of said lands as may be necessary to raise funds, but finally selling them to none but actual settlers. The resolutions also contemplated having the timber lands, mining lands, etc., ceded likewise, to aid in reclaiming irrigable lands, or to go to swell a general school fund. In brief the resolutions indorse the bill introduced by Senator Warren, of Wyoming, for turning the arid lands over to the States and Territories on condition that they shall redeem them through irrigation.

Other business was transacted of a more strictly local character; and, in an informal way, the convention expressed itself as in favor of early statehood for New Mexico, as solving many of the vexing problems that are now so discouraging and that deter the best class of immigrants from seeking homes within its borders, as they might otherwise do.

Drainage of a Small Lake.

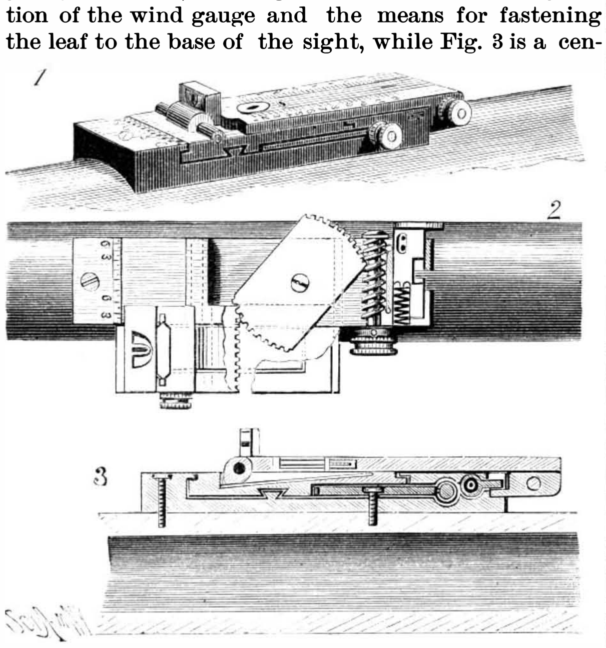
From the Cleveland offices of the Lake Superior, Cleveland and Pittsburg & Lake Angeline mining companies it is announced officially that work on the project of draining Lake Angeline has begun under a contract calling for its completion in five months, so says the *Marine Review*. The lake covers an area of 153 acres, and has a maximum depth of 43 feet, with a mean depth of 20 feet. The lake is owned by these companies, whose mines are already being worked beneath it, the Lake Superior and Cleveland companies controlling about equal portions of all but about one-fifth of the property, which is owned by the Lake Angeline company. This large body of water is being removed as a matter of safety to the present underground workings, but there is no telling, of course, what may be done in the way of further development of the properties when the water is out of the way. The companies undertaking this work are among the strongest in the mining business of Lake Superior, and there is little doubt that it will be carried out successfully. The contractor is C. B. Howell, of New York. A crib will be sunk while the ice is still on the lake. A centrifugal pump having a 20 inch suction and a 22 inch discharge, with a capacity of 15,000 to 20,000 gallons a minute, will be used, and the water will be discharged into the Carp River.

Extermination of the Texas Peccaries.

A recent publication of the National Museum contains a paper, by Mr. Frederic A. Lucas, on animals recently extinct or threatened with extermination. He finds that in nearly every instance the cause is "reckless slaughter by man." As an instance of the way in which animals may be destroyed, he refers in the introduction to peccaries. In 1885 these little animals were so abundant in several counties of Texas that their well-worn tails were everywhere to be seen, while their favorite haunts could be readily picked out by the peculiar musky odor characteristic of the creatures. Shortly after that date, hogskin goods being in favor, a price of fifty cents each was offered for peccary hides, with the result that by 1890 the peccaries were practically exterminated.

AN IMPROVED RIFLE SIGHT.

The illustration represents a rear sight for a rifle, which is adapted to be easily and nicely adjusted, and is especially designed to make proper allowance for the wind in the setting of the sight. It has been patented by Mr. Robert W. Parker, of Camp Huachuca, Arizona Ter. Fig. 1 is a perspective view of the device applied to a rifle barrel, Fig. 2 being a broken plan view, partly in section, showing the construction and operation of the wind gauge and the means for fastening the leaf to the base of the sight, while Fig. 3 is a cen-



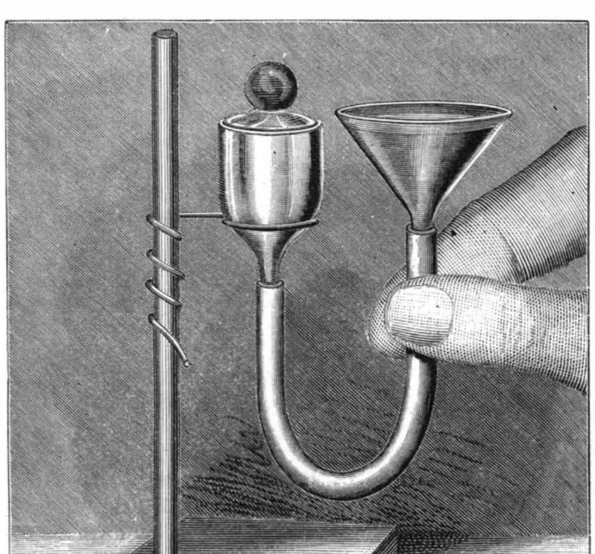
PARKER'S RIFLE SIGHT.

tral longitudinal section. The base of the sight is secured to the barrel in the usual way, and at its rear it is marked to serve as a wind gauge, indicating the extent to which a supplemental base is moved to one side or the other. This supplemental base slides horizontally in the main base and moves laterally on a dovetail rib, having a transverse toothed rack in front of the rib meshing with teeth on the rear end of a pinion pivoted in a recess in the base. The forward end of the pinion meshes with a transverse worm terminating at one end in a milled wheel, by turning which the supplemental base is moved out or in. Hinged to the rear of the supplemental base is a vertically swinging leaf, its pivoted end pressing upon a spring which holds the leaf in a vertical position when it is tipped up. When the sight is used for point blank shooting the leaf is turned down, the peep hole being made elliptical. The leaf is slotted, and a slide is held to move in the slot, the leaf also having counter grooves in which slides a head, moving obliquely when pushed up to counteract the drift of the bullet, the slide and head being connected, and each having peep holes to be used as sights, gauge marks on each side of the leaf indicating the range of the rifle when either peep hole is used. A novel mechanism is provided for raising the slide and holding it at the desired adjustment. If there is but little or no wind, the supplemental base and the mechanism carried on it are centrally held, but if there is considerable wind, the base is moved to the right or left as desired.

EXPERIMENT IN CAPILLARITY.

T. O'CONOR SLOANE, PH.D.

A very pretty experiment in capillary force, adapted



EXPERIMENT IN CAPILLARITY.

for projection by the magic lantern, is shown in the cut. It illustrates the attraction and repulsion between bodies surrounded by like or unlike liquid surfaces. If a body is partly immersed in a liquid which wets it, the liquid surface will rise in a curve all along its wetted surface, forming part of a concave meniscus. If another body in similar condition is brought near it, the two will be attracted and, if permitted, will be drawn together so as to adhere. This is shown by floating a glass ball in a vessel partly filled with water. Sooner or later it goes to the side and stays there in contact with the side of the vessel.

If a body not wet by water is immersed in it, the liquid will curve downward where it meets its surface, forming part of a convex meniscus. If two such surfaces are brought near together in the same liquid, they will attract each other also. An iron ball floating in a glass of mercury is drawn to the sides of the vessel, because the mercury does not wet either iron or glass.

In the experiment illustrated a straight-walled tube, about an inch in diameter, is connected with a funnel, by an open tube at its bottom and by a short piece of India rubber tube. The tube and funnel contain water. No air must be left in the rubber tube. As the funnel is raised or lowered, the level of the liquid in the tube will rise or fall. If the edges of the tube are perfectly dry or, still better, are oiled or coated with paraffine or beeswax, the liquid can be forced up far above the level of the tube, so as to form a meniscus. This, when projected by the lantern, especially if a reversing prism is used, will form in itself a very striking object.

A ball, which may be a Christmas tree ball, with any apertures closed by sealing wax, is floated in the tube. As long as the water is below the top of the tube, the ball will stick to the side of the tube. Now, on raising the funnel, the liquid will rise, carrying the ball with it. As it reaches the top of the tube and rises above it, it forms the convex meniscus. As this occurs, the ball, as if by magic, sails away from the side to the center, and remains there. If displaced, it returns to the center. On lowering the funnel, it again goes to the side as the convex meniscus gives place to a concave one.

This method of changing the water level is to be recommended, as it avoids the necessity of introducing anything from above, whether water or a solid object, in order to raise the level of the liquid. As shown in the cut, it is mounted for projection by the experimental lantern.

A Word to Inventors.

The following good advice to patentees we copy from the *Manufacturers' Gazette* (Boston). We commend it to the attention of patentees generally, who are too apt to reject very good offers for their patents soon after their issue.

We have frequently been asked by inventors who have succeeded in producing small articles of more or less merit, and for which there appears to be a demand, what is the best method to pursue in order to put them on the market.

This is a question which has puzzled a great many, and especially those who with small means are unable to go into the manufacturing of their specialty on a large scale, without parting with a controlling interest in their patent to another party in order to raise the necessary capital with which to push the business, a transaction which many object to on account of the possible and probable consequences which often follow, viz., the loss not only of the patent right, but of all share in future business.

In nine cases out of ten it is far better for the inventor, and he will realize more from his invention, to sell out entirely, and turn his attention to some other business, or the production of a new patentable article. That is, in case he has no money with which to develop and place his invention in the market.

The only difficulty in this is that a majority of inventors set too high value upon their inventions. They think they have the world in their hands, and are disposed to hold on to it, unless some one comes along who is foolish enough to pay an unreasonable price for the patent. This is where they are often mistaken, and it would be far better for them to accept a *bona fide* offer, even though it is but a fraction of their ideal value of the article.

The fact is that no invention, however valuable at the time it is produced or perfected, is sure of a monopoly or even a fair competing chance for a great while, and the sooner the inventor disposes of it, the better off he is. Thousands of inventions have been dead failures, and never returned to the inventor one dollar, simply because, thinking that he held a monopoly, and that the world was bound to him, he has held on to it, unable himself to put it upon the market, and alike unwilling to allow any one else to do so for a reasonable consideration, until some one else has come out with something equally good, and possibly an improvement, and he finds himself without a bidder, and another man making money which he might have had, had he used better judgment and good sense.

Another way in which a mistake is made is in starting out on too large a scale. If you have a really valuable patented article, there is very little difficulty about finding a market for it, if you are not too hasty. It is better to begin in a small way and gradually increase, than to begin by forming a large stock company and beginning too large. We are speaking in reference to the inventor's interests. If he can get his goods manufactured so that he can handle them himself, even though in a small way at the start, if his invention is worth anything, he will soon be able to increase his business and can then hold control of it himself. As a rule, we are of the opinion that it is better to contract with some reliable firm for the manufacture of the article than to go to the expense of putting in the necessary machinery, etc., to do it for yourself. This is especially true in relation to the smaller articles.

By doing it in this way, you are saved the care and management of a shop, and have more time to devote to pushing the sale of the article, and the difference in the cost is very little—hardly sufficient to compensate for the possible saving.

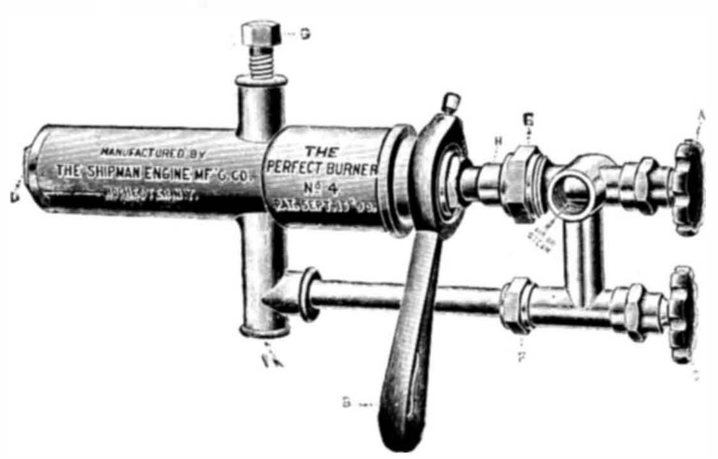
It also gives you the use of the capital which would be required to fit up and maintain a shop, with which to push the business, and at a time when it is needed, too.

After the business has grown sufficiently large to warrant it, then there is time enough to put in a plant, and you will be better able to do so, and you will be in a position to know what is required.

AN IMPROVED CRUDE OIL BURNER.

The competition between oil fuel and coal is a most interesting one, and certainly shows an increasing use of oil where the conditions are favorable for its employment. Perhaps the most conspicuous of the advantages possessed by oil over coal as a fuel is the readiness with which the most intense heat can be employed at any special point desired, and the economy with which it can be used for just the period required.

In addition there is a great saving of labor in the use of oil, and, as there are no ashes made, all the



AN IMPROVED CRUDE OIL BURNER.

work around the boilers and furnaces can be kept in a much more cleanly condition.

The obvious advantages possessed by oil have led to much experiment in designing the most efficient burner, and the one shown in the accompanying illustration, recently put upon the market by the Shipman Engine Mfg. Company, of Rochester, N. Y., is claimed to practically effect the most complete atomizing of the oil, thus insuring the most perfect combustion. It is also safe, because the oil is sucked up by the burner from the tank below its level, instead of being fed from a tank above, and depending on regulating devices, although it will work in either way. The regulation is effected by means of the lever shown, which is attached to the oil sleeve. In case of clogging, by opening the cleaner valve steam is allowed to pass through the oil chamber, cleaning the burner, without disconnecting any pipes at all. Likewise, the oil chilled or thickened by cold may be warmed and made to run freely by first closing the oil sleeve and then opening the cleaner valve, which will allow the steam to free its way up the oil supply pipe. The claim is also made that in point of economy in combustion it is unexcelled by any other petroleum oil burner. It is made in six sizes, and, as all the parts are interchangeable, cost of repairs is reduced to a minimum. In the illustration, A represents the steam valve; B, the oil regulating lever; C, the cleaner valve; D, the mouth of the burner; G, screw for attaching burner to boiler or furnace front.

The economy of using oil is now becoming recognized in many lines of business where it had heretofore been deemed inadmissible, and it has been found suitable for nearly all purposes that coal is used for, working successfully on boilers, brick kilns, forges, ovens, salt evaporators, driers, etc.

Compressed Air in Chicago.

An ordinance has been passed and signed by the mayor of Chicago giving permission to a company known as the Chicago Power, Supply, and Smoke Abating Company to lay pipes in the streets of that city for the transmission of compressed air as a motive power for machinery.

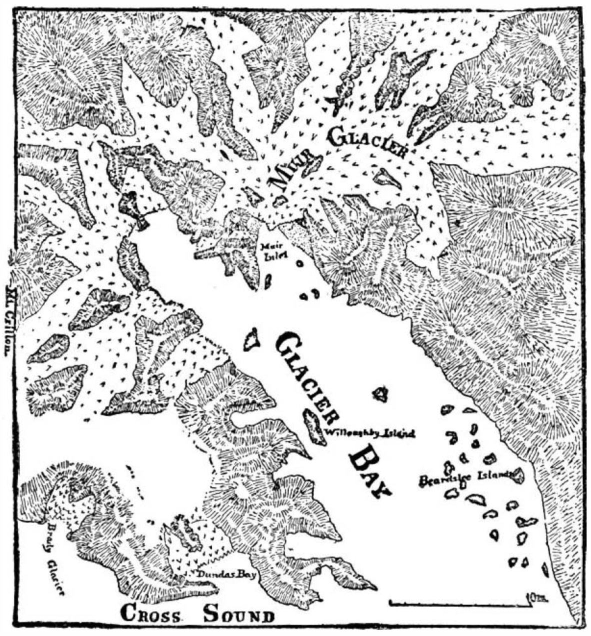
MUIR GLACIER, ALASKA.*

BY S. P. BALDWIN.

The first known of that greatest of Alaska's wonders, the Muir glacier, was reported in the account of Vancouver's explorations about Sitka in 1794, where he describes what is supposed to have been Glacier Bay as completely filled with ice and "terminated by compact, solid mountains of ice rising perpendicular from the water's edge." In 1879 the glacier was first described by Prof. John Muir, who spent some days wandering over the ice, a blanket and a few biscuits on his back and only the ominous roar of the sub-glacial waters to break the solitude. His vivid description, seconded by the tales told by Dick or "Professor" Willoughby, an old hunter of that region, led the steamer company to explore the bay, and now every steamer makes the extra journey of fifty miles necessary to allow its load of tourists to set foot on this great frozen sea.

As the steamer turns into Glacier Bay, what a marvelous sight appears! To the west the great St. Elias Alps tower above; Mt. Crillon (15,900 feet high), Mt. Fairweather (15,500 feet high), La Perouse, Lituya, and others nearly as high, covered with snow and ice to within four thousand feet of the sea, sending immense glaciers down to the ocean on one side and to the bay on the other.

A ring of peaks from eight to ten thousand feet high form the background to the north and east, a few of them bare of snow, but only because so precipitous. And now while we speak a great white cloud wraps itself gently about one of these bare peaks only to disclose it to view in a few minutes, shrouded in white fresh snow.



Map of Glacier Bay, Alaska, and its surroundings. Arrow points indicate glacial area. (Courtesy of Prof. G. F. Wright.)

From the flanks of these mountains come great frozen rivers, flowing steadily though slowly on to meet in one immense glacier in the amphitheater below, and march majestically on to the front to join in the cannonading of the icebergs.

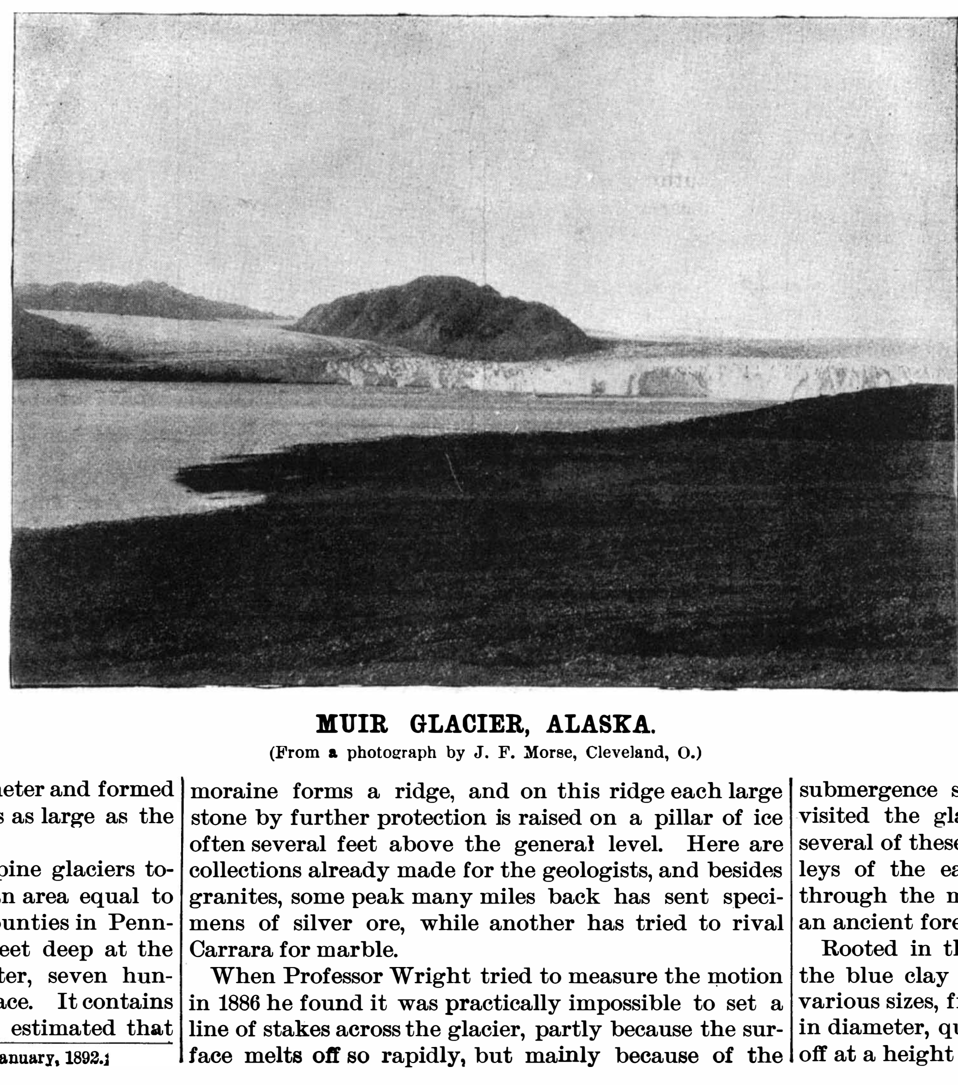
At the head, the long, narrow bay divides into two inlets. The next one, as yet not named, contains several glaciers which have not been explored. The Muir Inlet, to the east, is perhaps five miles long and two to three miles wide; on either side mountains rise abruptly, often perpendicularly, for the land here is "all on end," as is the whole of our northwest coast; at the head a wall of blue ice, a mile long and about four hundred feet high, cut into towers, castles, and caverns, threatens with groaning and thundering, as prisms from the size of a paving stone to the size of the Cologne Cathedral go crashing down to the water, throwing the salt spray hundreds of feet into the air, sending forth waves to lash the shores throughout the bay and echoing among the mountains as a thunder storm.

These icebergs float off down the bay, some stranding and melting where they are confined; others, pushed about by wind and tide, form impassable jams, ringing merrily as the waves rock them back and forth.

The ascent of one of the neighboring mountains discovers the home of the mountain sheep, for to the height of three thousand feet there extends a rich carpet of grass, and many familiar flowers, as the epilobium, goldenrod, and blue-bell, remind one of home, while each little ravine contains its snow bank and the accompanying pool of clear, cold water. The scene from here is magnificent; high mountains on every side, and nestled at our feet, this great sea of ice thirty miles in diameter and formed of many branches, any one of which is as large as the Gomer or Aletsch of Switzerland.

This glacier is as large as all the Alpine glaciers together, twelve hundred square miles, an area equal to Lehigh, Northampton, and Carbon Counties in Pennsylvania combined, and a thousand feet deep at the mouth, three hundred feet above water, seven hundred feet perpendicular below the surface. It contains more water than Lake Erie, and it is estimated that seventy-seven billion cubic feet of ice are discharged into the bay as icebergs every year, and no less than one hundred and seventy-five billion cubic feet of water melt from the surface and flow into the bay as sub-glacial streams in a year.

* Abstract from the *Lehigh Quarterly* for January, 1892.



MUIR GLACIER, ALASKA.

(From a photograph by J. F. Morse, Cleveland, O.)

The most rapid motion is from the north through the center, and so rough is the ice here that it is impossible to cross it. Immense crevasses, ridges, pyramids, and towers are mingled in the wildest confusion, as in a stormy sea; moraines and bowlders—all that dare approach are swallowed up in the yawning crevasse.

The ice of the eastern half is moving much more slowly and is consequently much smoother, broken only here and there by crevasses, so that one may walk for miles up the glacier at a gradual ascent of one hundred feet to the mile until the névé is reached.

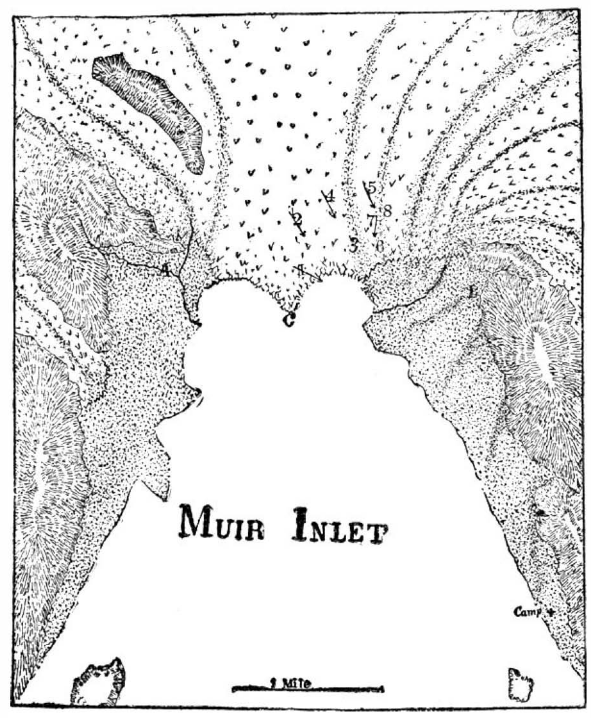
During the summer the surface disintegrates and melts off two inches a day, forming thousands of little rivers flowing in all directions and joining in larger streams until finally they reach a crevasse or a round deep hole, called a moulin, into which the waters are precipitated to join the rumbling streams beneath.

While the surface appears white, a glance into a moulin tells a different story, for just below this white ice a clear sea-green appears, which grows darker and clearer as the ice is thicker, until an intense blue beckons us to the crystal depths.

The slower moving ice is often heavily loaded with stones and earth, for of course each branch bears two loads of moraine in to the great basin, and this protects the ice from the sun as a blanket until the moraine forms a ridge, and on this ridge each large stone by further protection is raised on a pillar of ice often several feet above the general level. Here are collections already made for the geologists, and besides granites, some peak many miles back has sent specimens of silver ore, while another has tried to rival Carrara for marble.

When Professor Wright tried to measure the motion in 1886 he found it was practically impossible to set a line of stakes across the glacier, partly because the surface melts off so rapidly, but mainly because of the roughness of the central portions; then, after a base line had been established and accurately measured, it was suddenly discovered that the base line was on moraine-covered ice and probably moving. Finally a base line was staked off on dry land and measurements taken on certain peculiarly shaped ice pillars at various distances, and the angles read every four days.

The motion found by Professor Wright was in the center about sixty-five feet a day, and less, of course, nearer the sides. That seems very rapid when compared to the Alpine thirty-three inches a day, but here we have an enormous mass of ice all crowding through a narrow opening, but pressing toward that opening from every side. The width and depth of the ice greatly reduces friction.



Map of Muir Inlet, showing converging moraines and form of front in 1886. A, buried forest; B, base-line. (Courtesy of Prof. G. F. Wright.)

Since the Muir glacier was measured, a similar rate has been found in a number of glaciers in Greenland, and in one case a rate of ninety feet a day was found. In 1890, when Professor Reid measured the motion, the front was found to have retreated more than half a mile, so that the first two branches barely, if at all, added their pressure, and the rate was increased.

The width of the water front is about a mile, but the whole width between the mountains at the mouth is about two miles. On either side is a triangular patch of moraine half a mile wide at the head, in which the glacier ends, and extending about two miles down the inlet, separating the water from the foot of the mountains, but narrowing and disappearing beyond that point.

Near the foot of the mountain, on the east side, a large subglacial stream bursts forth, under a considerable pressure, so that a column of water three feet in diameter boils up to a height of about four feet.

Not only do great columns of ice break off above water and become bergs, but quite often large blue masses rise from the bottom and these usually carry quantities of debris, locked in their embrace, to be dropped one by one, as the berg melts, into the fine deposit just described. Here is formed what is known as modified drift.

Examining the terminal moraines at the sides, we find very few scratched stones and very little chance to study the deposits made beneath the ice, for it is all covered by the coarse material of surface moraines—bowlders of all shapes and sizes, sharply angled and mixed with very little fine clay, very different in appearance from the till near Belvidere, yet having the same unstratified, plums-in-a-pudding character.

It seems that the glacier has been receding for many years, and as it has retreated the side streams have cut new and shorter channels successively, until there are now on the east side nearly a dozen such empty channels and as many parallel ridges.

One form of deposit, which has led to great misunderstanding as found in the States, is shown at the Muir glacier, but not so well as that found by Mr. Russell in the summer of 1891 on the Malaspina glacier near Mt. Saint Elias. Sometimes the surface water, unable to find escape, is held backed up into a lake against the mountains at the side, there to form a true lake terrace. This may explain many of the high level terraces found in the glaciated area, without the great submergence sometimes claimed. Mr. Cushing, who visited the glacier with Prof. Reid in 1890, describes several of these lakes as found near the heads of valleys of the eastern side. The stream which cuts through the moraine of the west side has uncovered an ancient forest buried deep in the glacial sands.

Rooted in the peat and sending their roots far into the blue clay are many stumps or trunks of trees of various sizes, from an inch or two to more than a foot in diameter, quite bare of bark and invariably broken off at a height of ten to twenty feet and the top bruised in the direction down the inlet. This forest has been covered to a depth of nearly a hundred feet by the fine sand of a portion of the moraine, which extends several miles down the inlet, on that side, at a constantly decreasing altitude. The fact is that since these trees grew the glacier has advanced until it glided over the trees and over this whole moraine, then it has receded again and a little stream is now doing what the great glacier could not do, root out the trees.

How long the ice may have passed over the buried forest, or how old the trees are, cannot be certainly stated, but the ice must have filled Glacier Bay since the trees grew, and that must have been several hundred years ago—and may have been several thousand. Yet the wood is now so fresh that it might well be but a few years old. That the ice filled Glacier Bay within a few hundred years is very evident from the condition of the vegetation, for there are no trees nearer than Beardslee Islands, though the conditions are very favorable. The smaller vegetation has spread more rapidly and covers the mountains, while it is gaining some foothold on the moraines about the mouth. Here the plants grow less in quantity and variety nearer the glacier, until within half a mile of the ice no plants are found. Again the mountain sides are very handsomely grooved to a height of 3,000 feet, and even the polish is well shown, though rocks in this atmosphere disintegrate very rapidly. Debris, too, can be found at a height of 3,000 feet, and Vancouver's descriptions seem to show that the ice in his time, though not filling the bay, extended much farther down. Not only has the glacier retreated a long distance since Vancouver's time, but it is now retreating very rapidly. Photographs taken by Professor Reid's party in 1890 show that the front has receded about 3,000 feet in four years, and the steamer company report that since 1883 it has receded over a mile. The ice front has decreased in thickness also, for it is now at the same height, above water, 300 feet, but back at a point which was 400 feet high in 1886. Mr. Cushing shows that the glacier is dying out, about the heads, with equal rapidity, so that the ice retreats from the mountains into the basin and the source of supply is cut off.

Railway Rust.

The rusting of rails in long tunnels is the subject of a recent article in the *Civil Ingenieur*, describing the results of observations in the Altenberg tunnel, which is about 1,230 feet long and located on a curve of 2,950 feet radius. The rails had been down for 11 years, and at the end of that time were covered to a depth of 0·16 to 0·24 inch by hard scales, which could only be removed by a knife. They were composed mainly of iron sulphide, and were found principally on the web. While the weight of the rail was much reduced in this manner, its sectional area was found to have increased, owing to the flaky character of the rust. The new rails have been covered with a mixture consisting largely of tar, which is renewed every six months. The gravel ballast has also received a partial covering of broken limestone, and by these means it is hoped that the formation of rust will be retarded. In the Brandleite tunnel, in Thuringen, it was found that rails and metal ties were destroyed by rust as fast as by the passing trains. The ties lost about 5·9 pounds each in six years. This tunnel is nearly 10,000 feet long, and is on a tangent having a 1 per cent grade.

Tropic and Semitropic Fruits and Nuts.

For the first time the Census Office has made a special investigation for the purpose of ascertaining the extent and value of the production of oranges, lemons, figs, almonds, cocoanuts, and other tropic and semitropic fruits and nuts as industries of the United States. A preliminary report has been prepared by Mr. J. H. Hale, special agent, under the direction of Mr. Mortimer Whitehead, special agent in charge of horticulture.

The material from which these statistics are compiled was obtained direct from the growers upon schedules specially prepared for that purpose and by personal visits of special agents to sections of the country where these products are grown.

From the tabulations in Census Bulletin No. 161, it appears that, in addition to the tropic and semitropic fruits and nuts grown for home and family use, there were in the census year 13,515 acres of almond, 677·50 of banana, 169·88 of citron, 9,864 of cocoanut, 4,477 of fig, 550 of guava, 1,362·25 of kaki, 7,256 of lemon, 495·58 of lime, 12,180 of madeira nut, 7,097 of olive, 184,003 of orange, 2,189·50 of pineapple, 171·89 of pomelo, and 27,419·50 of pecan trees, representing 658,566 bearing and 800,010 nonbearing almond trees, 577,782 bearing banana plants, 4,237 bearing and 14,110 nonbearing citron trees, 123,227 bearing and 1,199,549 nonbearing cocoanut trees, 138,186 bearing and 285,201 nonbearing fig trees, 32,943 bearing and 120,529 nonbearing guava trees, 58,390 bearing and 124,522 nonbearing kaki trees, 167,663 bearing and 498,784 nonbearing lemon trees, 19,096 bearing and 44,255 nonbearing lime trees, 188,409 bearing and 411,248 nonbearing madeira nut trees, 278,380 bearing and 331,022 nonbearing olive trees, 3,885,890 bearing and 9,705,246 nonbearing orange trees, 21,750,000 pineapple plants, 3,279 bearing and 12,867 nonbearing pomelo trees, and 214,988 bearing and 657,980 nonbearing pecan trees.

Excluding pineapples and bananas, which are all counted as bearing plants, as they commence fruiting within a year of planting, it will be noted that the average number of all nonbearing trees is about double that of the bearing trees, the product of which in the census year was, as far as reported, valued at $14,116,226.59, divided as follows: Almond $1,525,109.80, banana $280,653.75, cocoanut $251,217.41, fig $307,271.76, lemon $988,099.92, lime $62,496.90, madeira nut $1,256,958, olive $386,368.32, orange $6,602,099.06, pineapple $812,159.17, pomelo $27,216, and pecan $1,616,576.50. On the basis of present prices, with all the nonbearing trees in fruitage, the next census ought to show a value of product of more than $50,000,000. As a forecast of the future growth of these branches of horticulture, in addition to the acreage already planted, the number of acres of land in the United States susceptible of development in plant in any one or all of the fruits and nuts named has been ascertained, and the aggregate figures are also given.

THE LOVELL DIAMOND SAFETY BICYCLE.

The accompanying cut shows the 1892 model which the John P. Lovell Arms Company, of Boston, Mass., have just placed on the market. The frame is of the diamond pattern, and made entirely of seamless steel tubing and drop steel forgings. Front wheel 30 inches, with 1¾ inch pneumatic tire; and rear wheel 28 inches, with 2 inch pneumatic tire; ball bearings of the improved pattern to wheels, crank shaft, pedals, and head; gear, 57 or 60 inches. Scorcher saddle and loop saddle post furnished, if preferred. Weight, complete, 43 pounds; stripped, 38 pounds. The Lovell wheels are guaranteed in every respect. They are a reliable and high grade wheel. The Lovell Company have moved their factory to Fitchburg, Mass., and their works, when completed, will form one of the largest manufactories of bicycles and firearms in the world.

THE LOVELL DIAMOND SAFETY BICYCLE.

The Future of Manufacture.

Ex-Governor Goodell, of New Hampshire, responding to this toast at the recent hardware dinner in this city, said: We have been told this evening truthfully that we made a year or two ago about ten millions of tons of iron in this country. This is certainly an enormous amount, but it is easily explained, yet, when we remember that, when we make 10,000,000 tons of pig iron in a year, we are making 27,000 tons in a day, and we are making a car load of pig iron a minute for every day of the year counting Sundays and holidays, are we to continue such an enormous production? Can this country consume such a quantity? Or are we in the near future to find such a reversion in this business that many of our furnaces will be obliged to bank their fires and go out of blast? It is a question too much for me, and I think, possibly, too much for you to decide. Yet I have great confidence in the future. In considering the future we must consider the past. A few years ago our bridges were all made of wood, with the exception of a few bolts and pins. Now they are made almost wholly of iron. A few years ago our fences were made almost wholly of wood. Now barbed wire is used everywhere and the barbed wire business is one of the largest in the country. It is spreading all over the country, and it is likely to spread more and more in the future. We are constantly designing and discovering uses for iron and steel. Last night, as I was riding in a railway car, a fellow passenger asked what would the railroads do for ties in a short time. I then remember that just a few days before I had heard that steel ties had been put into use and that very soon it would be likely that they would take the place of the wooden ones on every railroad in the country. Then, when I remember that invention is going on all the time; when I realize that Morse, Fulton, Edison, and all the greatest inventors of history have been Americans; when I realize that a few years ago a hall like this would have been lighted with sperm oil distributed from New Bedford, then a little later by gas, and that to-night we have this beautiful light, I have great hopes for the future of manufacture.

You tell me that we are living in a generation the like of which has never been known in the earth's history, and you will also perhaps tell me that we are living in a generation the like of which will never be known again, but I believe that we have just begun to discover great things. What they will be no one can tell. We have been told about iron in the blood to-night, how it makes mind and muscle strong. My friend and myself are strong prohibitionists and we believe that the time is speedily coming when prohibitionists will have prohibition, and when those who are accustomed to the use of such things as produce intemperance will be seeking it as a substitute. (Applause.)

We can hardly conceive of its various uses. I am told that Edison is just now engaged in putting up wires around a mountain of iron, by which he expects to hear the sound of the great explosions that occur from time to time in the sun. I am afraid that I shall never hear the sound of the explosions in that great luminary, as I am growing old, and I am afraid, too, that should he be able to hear them, the great Creator of all things would cause him confusion as he did at the tower of Babel.

We can scarcely imagine, in the midst of all this, what the future is going to bring us. I have great confidence in her gifts, but perhaps something should be said about the profits in the manufacture of the future. Are we going to make money by them? The price of everything is going down, is cheaper to-day than yesterday. A few years ago, the price of steel was 10 cents a pound, and we can buy just as good steel now for a third of that sum. The price has been constantly decreasing in almost every branch of manufacture. We are constantly being told that the price is so low and the profits so small that we will be obliged to give up business soon. I tell you that we old fellows who have an oldish way of doing business, a rut in which we have been accustomed to let things run, and who think that we can do business in no other way, will be obliged to go out of the trade. We will go to the wall, but the young man with his eyes open, and who is awake to the responsibilities of his position and who is not content to remain in the groove of his father's methods, which were the proper ones thirty years ago, will devise some new method, some new way, and he will produce the goods we have been selling at a ruinous loss so that he will be able to make money on them.

Cement Floors.

Recently I visited a newspaper pressroom, says a contributor to the *Art Printer*, which was, like the majority of pressrooms, especially those for newspapers, located in the basement of the building—an essential in placing a large machine or a number of them on a solid foundation. To prevent the dampness arising from the earth and injuring the press and rollers a concrete floor had been laid before the press was set up.

After examining the press, the pressman informed the writer that he had swept the floor several times during the day, but that the dust seemed to accumulate rapidly again. No dust was blown in from the outside when the doors were opened, as the ground was frozen and covered with snow. The dust was ground out of the concrete by the tramping of the persons employed in the room.

This dust is not like the ordinary house dust, but is of a coarse, gritty nature, and when blown about the press by the circulation of air through the room is sure to settle on the joints, journal boxes, and in the oil holes and fountain, no matter how carefully they may be covered or protected, and in a short time will do incalculable injury to the machine.

Joists should first be laid and the spaces between them filled with concrete until nearly level with the top, and a well joined, hard wood floor laid over all, which will wear better than the concrete and be more satisfactory than any other floor that can be put in a printing office or workshop. The proprietors of printing offices, who contemplate the erection of new buildings or repairs, would do well to make a note of this.

[The trouble above mentioned was due to poor cement, which did not bind the sand. First class Portland cement one part, fine, sharp, clean sand two parts, properly mixed and laid, will make a superior floor—a veritable artificial stone, which ordinary use will not abrade.—ED. S. A.]

"A TRIP TO THE MOON."

This is the title of an illustrated scientific lecture presented biweekly at the Carnegie Music Hall, in this city. The Urania Astronomical Society, of Berlin, brought out this unique spectacle three years ago, since which time it has enjoyed great popularity. The managers of Music Hall—founded by Mr. Andrew Carnegie—secured not long since the scenery and apparatus for production at that hall. The lecture, since its introduction here, has been rewritten by Mr. Garrett P. Serviss, the well known astronomer and astronomical lecturer, and it is now presented in a manner which commands great interest and attention. The lecture is opened by some interesting statistics regarding distances, masses, etc., which are well calculated to astonish the unastronomical hearer. The first scene is the reproduction of a solar eclipse as it was seen from the shores of one of the Havel lakes, near Berlin, on the morning of August 19, 1887. On this morning the sun arose with the greater portion of its disk obscured by the moon. As the sun ascended, the crescent diminished, and at the moment of totality the wonderful corona flashed into view. This scene gives the listener an idea of what the astronomers mean when they attempt to describe this wonderful phenomenon. Slowly the moon passes from before the sun until the earth is fully illuminated and the sky and landscape assume their normal appearance.

Interesting as these imitations of celestial and terrestrial phenomena are, the manner in which they are effected is still more so, and our front page illustration gives a peep behind the scenes and explains the means by which the illusion is produced.

The trees and foreground are set in front of a transparent prospect upon the back of which the opaque parts are silhouetted in black, leaving the sky and water translucent.

Two optical lanterns, one of which carries the crescent and the other the corona slide, are mounted upon a box movable along the inclined side of a triangular frame by a drum and cord, and are thus enabled to imitate the appearance and course of the heavenly bodies. The screen immediately below the horizon intercepts the image of the luminary below that line.

The waves that play upon the surface of the lake are produced by a slide in a third lantern. This slide consists of clockwork, governed by a set screw, and actuating three eccentrically mounted rods moving in parallel planes and supporting glass screens upon which waves are painted. The interference of these waves permits ribbons of light of constantly varying position and width to fall upon the screen and give the effect of water ruffled by a breeze.

The play of natural variations in color and intensity of light produced by the revolution of the earth and its passage through the penumbra and umbra of the moon's shadow, and the development of full sunlight, are perfectly co-ordinated with the changing conditions of their source, the sun. This part of the illusion is effected by the management of the foot and border lights. These lights are red, white, and blue incandescent electric lamps arranged in series and controlled by a regulator permitting every possible variation, combination, gradation, and intensity of tint, and to its intelligent manipulation much of the success of the scene is due.

Our interest in this mysterious darkener of the sun is now gratified by a view from the distance of five thousand miles, showing the lunar mountains and other prominent features.

The plaster image of the moon viewed through a circular piece of gauze set in a black drop curtain is three meters in diameter. The changes of phase are produced by the light thrown from the lanterns as shown in the illustration.

The vicinage of Mounts Aristarchus and Herodotus and a view of Cape Laplace are shown from a height of two and one-half miles. These splendid scenes are a triumph of science and scenic art.

By trigonometric mensuration of the shadows and application of their values by perspective, the artist is enabled to represent the general features of the landscape with fidelity. These scenes are lighted from behind by four arc lights and a bench and foot lights, having a combined illuminating power of 8,500 candles; and well bring out the contrasts of earthly landscapes, softened and harmonized by the presence of air and life, with those of the moon, which, under a sky of eternal blackness, glitter in a jeweled panoply of death, for the moon is a dead world.

From the moon's surface the earth always seems to occupy the same place, and reflects to the moon a part of the light received from the sun. This earth light is observed when the new moon is first seen, and also when the old moon disappears.

The phenomena of earth light and sunrise on the moon is given by transparent earth painted in the sky and lit up by a lantern. The mountains on either side have a lantern each, whose light is permitted to fall on the drop by gradually lowering a screen.

A modified arc light illuminates the front of the scene and gives the earth light.

Probably the most unique of the cosmic phenomena unfolded is a solar eclipse viewed from the moon.

The earth is an opaque disk, with a red gelatine band attached to its circumference with white muslin, and suspended from two hooks set in a shelf extending across its back. A coat of phosphorescent paint gives the glow. The sun consists of a box with a cover of isinglass, on which the sun is painted. Semicircular wooden arms inclose a reflector, and support six incandescent lamps, set radially inward.

The box hooks into a piece of leather with a circular aperture coincident with the sun's face and sewed into the drop. Holes in the drop allow the light from an arc light to imitate stars.

The surface of the moon is painted on canvas supported on hinged props having spread feet; a stiff rod joins the hinges and forms the horizon. A footlight is placed within this tent-like cover to illumine it.

The drop curtain carrying the sun box is raised by a windlass, and as the sun rises accompanied by the stellar host, the footlight is turned up. In passing behind the earth the sun imparts a crimson hue to the earth's atmosphere, which the footlight transfers to the moon until the extinction of the solar disk. The return to earth is marked by a view of that part of the earth's surface most resembling the moon's, the Tyrolean Highlands. The after glow of sunset, moonrise and a lunar eclipse are depicted with great accuracy.

The gradual movement of a deep red gelatine film across the lantern slide holder causes the moon to appear to enter and emerge from the earth's shadow.

A sunset in the Indian Ocean and moonrise on the first scene conclude the lecture. A series of stereopticon views of great beauty are interspersed between the mounted scenes, and thus a continuous and most interesting entertainment is provided.

The scenery and ingenious mechanical effects are designed by Mr. W. Kranz. The regulator is the invention of Mr. J. Carl Mayrhofer, the electrician of the theater. The stage plugs used for electrical connections enable that part of the work to be effected instantly. The work of this scientific theater is not to be confined to astronomy alone, but is intended to embrace those sciences that can be attractively illustrated.

Caviar.

Caviar, which is made from the eggs of the sturgeon, is an important article of exportation for many cities of Russia and Astrakhan, and principally Taganrok. The annual amount is estimated at 40,000 pouds (1 poud=35 pounds). The greater part goes to Turkey, Greece, Italy, and Germany, very little to England, and still less to France. The fisheries are situated at the mouth of the Volga, upon the banks of which stand vast storehouses with basement and cellars in which are found the tubs that contain the brine used in the preparation of caviar. The most profitable fishing is done in autumn, this season yielding the largest quantity of eggs. In winter, the fishermen make large holes in the ice and fish with the spear. At all other times they use nets, about 300 feet in length, to which are attached cords provided with hooks. Each of these is strong enough to hold a fish of large dimensions. Each establishment owns a fleet of boats. The fishes brought on board are laid upon boards and covered with salt, and are then opened for the purpose of extracting the eggs and the entrails, which the Russians are very fond of, and which they eat in a fresh state. For exportation, caviar is prepared in two different ways: 1. The eggs are washed and then immersed in strong brine for three quarters of an hour and finally allowed to drain. In this way "granular" caviar is obtained. 2. For "compact" caviar, the eggs are first cleansed, then pickled and finally allowed to dry slowly. Then they are packed closely in canvas bags which are inclosed in wooden barrels, after which they are ready for shipment. A ruder process, but one much used in the trade, consists in immersing the eggs, immediately after collection, in brine, wherein they are left for several months, after which they are dried in the sun.—*La Nature.*

A Tar Asphalt Lacquer for Iron

is composed of 30 parts of West Indian copal, 30 parts of American pine resin, 30 parts of mineral asphalt, 30 parts of tar asphalt, 5 parts of yellow wax, and 6 parts of Venetian turpentine. These ingredients are melted and uniformly mixed by stirring. If the mixing is properly done the melted compound runs off the spatula in a cohesive, uniform, thick stream. The following are then added to the substance while it is still moderately warm: Twelve parts of resin oil, 30 parts of linseed oil varnish, 30 parts of turpentine oil, and, finally, from 30 to 45 parts of benzine. If it be desired to make the lacquer thin fluid, the quantity of benzine is increased. Painting must be several times renewed, the more often the finer the appearance.

FLANGED pulleys destroy many good belts. A properly rounded pulley will retain the belt on the center. A belt ought only to have contact with the pulley face.

Correspondence.

Detecting a Mirage.

To the Editor of the Scientific American:

In answer to "R. M." (4171), who inquires about means of detecting a mirage, will say: If the mirage be near the horizon, as was the case in each instance observed by the writer in Southern California, the deception may easily be eliminated from the real by bending close to the ground and taking a view, then suddenly rising to the full height, keeping the eye on the scene in meantime. Then reverse the plan. Before bending very low, the false view suddenly "shuts out," or disappears as by a screen, while the real scene only disappears as terrestrial objects hide it. In certain instances it is well to add to the upright view by a jump if no object can be utilized. This experience adds to the novelty of a mirage, and is wholly convincing.

JOHN S. PALMER.

Litchfield, Ct., March 26, 1892.

Occupation for Old People.

To the Editor of the Scientific American:

I have been much interested in the discussion in relation to the suitable occupation for aged and feeble people, and in the many good suggestions offered I have not seen a word regarding one of the most interesting occupations that an old or retired person can devote himself to, and that is the breeding of poultry. There is nothing more suitable to one with feeble health than the care of a growing flock of poultry, whether it be of common barnyard stock or the purest of pure bloods. There is especially in regard to the latter a fascination that has enraptured many a tired-out business and professional man, and the old men will find in it an ever-changing, an always-interesting, and many times a puzzling topic of study. And there is an incentive of profit that should not be overlooked. How to feed to get the best supply of fresh eggs, the proper course to follow in setting the old hen, the impatient longing to see how many chicks she will bring off, the pleasure of "counting the chickens before they are hatched," and then to watch the growth and development of the future prize winners—all of these serve to stimulate and keep up the interest of many an old man who is weary with nothing to do. Then there is plenty of opportunity for him to exercise his ingenuity in building houses, fitting up his yards, and the thousand and one things necessary to the proper care of fine fowls, that he need not complain for lack of occupation. Let the old man invest in a pen of Brahmas or Plymouth Rocks; my word for it he will take a new lease of life. And when he partakes of an egg laid on his own premises, or masticates the juicy flesh of a home-grown broiler, it will be with a keener relish and a sense of satisfaction that can only be realized by those who have earned their appetites by their own exertions.

W. H. HAMILTON.

Danielsonville, Conn., March 23.

Aluminum as a Coin.

Sir Henry Bessemer points out the insecurity and inconvenience of the proposed £1 note, and suggests the introduction of a coin which shall represent a value of £1, and be redeemable on presentation. He says: The issue of a coin which shall represent a value of £1, and be redeemable on presentation, would, it seems to me, be in itself as acceptable a security as a promise to pay printed on paper; while the convenience of handling in the daily course of trade, its safety from injury or destruction in the pocket, or from accidents by fire or water, and its immunity from the accretion of dirt and the consequent indistinctness of the paper note, are greatly in favor of the coin. The first impression produced on the minds of many persons by this proposal will naturally be the door which it apparently opens to fraud by the casting of such coins in plaster of Paris moulds and the coating of them by the electrotype process, just as base silver coins are now made. Some ten years ago such fears would have been well founded, but the science of metallurgy has given us a new metal which effectually bars the way to this mode of forgery, while its distinctive character is so clearly defined that a child could tell, even in the dark, a genuine coin from a spurious one. The new metal—aluminum—may be slightly alloyed, so as to harden and increase its durability, and at the same time raise its fusing point, and thus render the casting of it in plaster moulds quite impossible. The specific gravity of aluminum is 2·56, while that of silver is 10·47, so that an aluminum coin of the exact size and thickness of a common florin would weigh a minute fraction less than a silver sixpence; hence, as I before observed, if taken from the pocket in the dark it would be instantly recognized by its extreme lightness, and could never be mistaken for any coin made of gold or silver, while the great weight of all lead or pewter alloys, which are capable of being cast in plaster moulds, would not admit of their being passed off as aluminum coins, however their external surface might be coated or colored in imitation of that metal.

INAUDI, THE CALCULATOR.

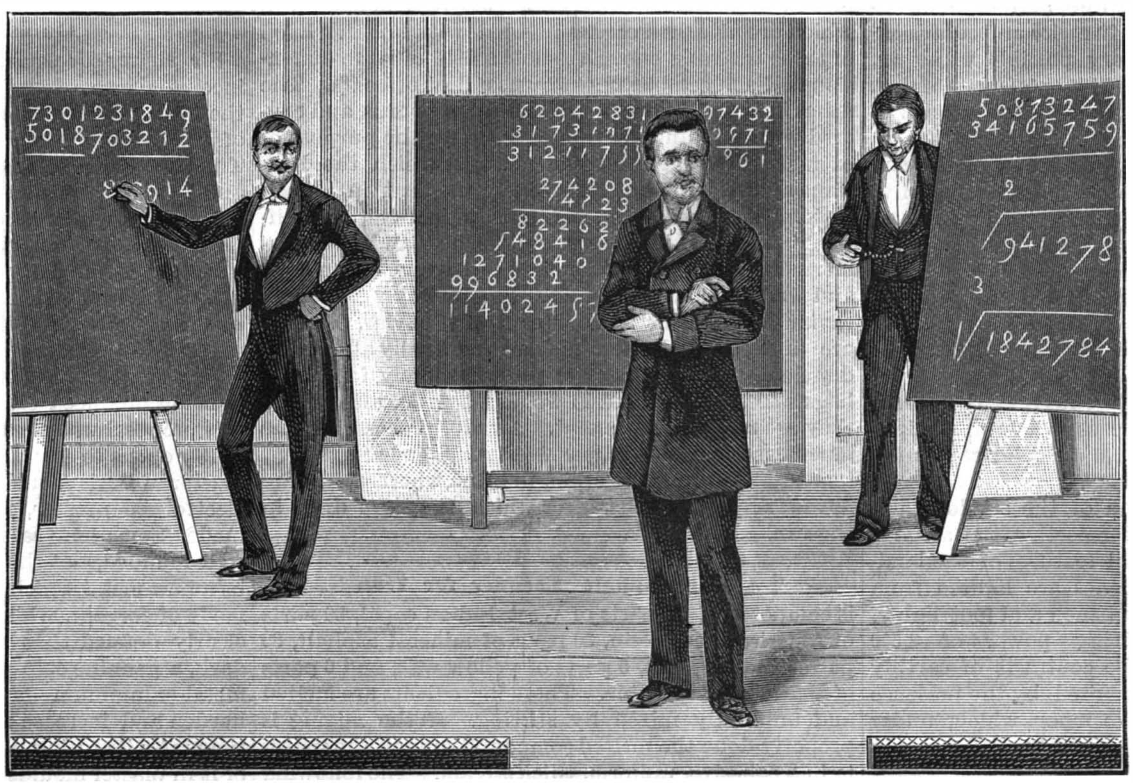
A few years ago we spoke in these pages of a twelve-year-old child who had been presented to the Society of Anthropology as a prodigy of a new kind, and who performed the longest and most complicated calculations in his head. The name of this child was Jacques Inaudi. After going the rounds of country cafes, where he succeeded in earning his living by amusing the curious with his extraordinary calculations, Inaudi, who is now twenty-four years of age, has put himself under the direction of a manager, who gives public exhibitions of him in one of the concert halls of Paris. The faculties of this young man are extraordinary, and it has appeared to us that his history merits a detailed study. We shall have recourse in great part to a very complete work upon the calculator that has just been published by Dr. Marcel Baudoin.

Inaudi was born on the 13th of October, 1867, at Onorato, in Piedmont. In the country of his nativity, he, like Henri Mondeux, another celebrated calculator, began by guarding sheep. He soon followed his father, who played the organ in the various cities of the south of France, and it was by instinct, and without any one having taught him anything, that the faculty of making mental calculations came to him.

He began to exhibit himself in a cafe at Marseilles. His reputation soon increased, and in 1880 he came to Paris. He was then twelve and a half years of age. He was submitted to examination by Broca in the session of the Society of Anthropology of the 4th of March. After this epoch he made the tour of the country, as we have said, and it was brt a short time since that he returned to Paris. He was presented to the Academy of Sciences at the session of the 8th of February, 1892.

Dr. Marcel Baudoin, who has submitted Inaudi to a special examination, describes the latter's astonishing operations in the following words:

We must now make known what extraordinary feats Inaudi is capable of performing. Standing upon the stage near the prompter's box, he turns his back to the blackboards placed in the rear of the stage, and upon which the manager writes the known quantities of the problems given, in order to permit the audience to take account of the calculations effected. With his hands crossed upon his chest, he listens with extreme attention to the question addressed to him, repeats it, and has it repeated, if necessary, until he understands it perfectly. He furnishes a correct solution almost immediately, without ceasing to look straight into the faces of the spectators, without writing anything (he never writes in calculating), and without being disturbed, whatever noise be made. Do you wish an example? He adds in a few seconds seven numbers of from eight to ten figures, and all this mentally, through means peculiar to him. He subtracts two numbers of twenty-one figures in a few minutes, and as quickly finds the square root or the cubic root of a number of from eight to twelve figures, if such number is a perfect square. It takes him a little more time when in this extraction of square or cubic roots there is a remainder. He finds, too, with incredible celerity, the sixth or seventh root of a number of several figures. He performs an example in division or multiplication in less time than it takes to state it. What is still more astonishing, an hour after performing all these mental operations, and after finding a solution of problems that are very difficult to solve by arithmetic, he recalls, with most remarkable precision, all the figures that he has had to operate upon.

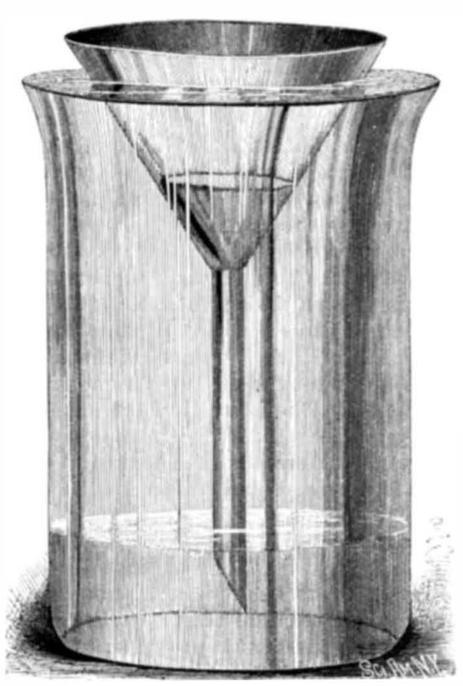


JACQUES INAUDI, THE RAPID CALCULATOR.

Our figure represents Inaudi at the moment of his experiments. While the calculators standing behind him are performing upon the blackboards the examples given by the spectators, Inaudi, without ever looking at the boards, talks with the spectators and immediately solves other small problems. Some one asks him, for example, "On what day did the 11th of January, 1787, fall?" He answers at once: "On Thursday." And the answer is correct, as is verified by the spectator who asked the question and who has brought an old almanac with him. At moments, Inaudi stops his conversation, and, with his arms folded, he is observed to reckon upon one of his arms with his fingers, as shown in our engraving. He then asks for a few minutes of silence, in order that he may verify the calculation that he made amid the noise and while he was talking. Errors on his part are not frequent, as Dr. Baudoin remarks.

He is rarely deceived, and when he states a result it has many chances of being accurate. If he is deceived, he quickly recognizes his error, for he says that he always proves the operations that he has had to perform.

Broca, in 1880, was unable to get an insight into his processes of multiplication, and this he confessed without any circumlocution. Now that Inaudi possesses a



A HYDROSTATIC PARADOX.

well developed intelligence, he explains them without trouble. While we begin to reckon from right to left in multiplication, he proceeds, on the contrary, from left to right.

Say we have to multiply 345 by 527. The series of operations performed by Inaudi is as follows:

1. 300 × 500 = 150,000
2. 300 × 27 = 8,100
3. 527 × 40 = 21,080
4. 527 × 5 = 2,635

Total, 181,815

Altogether, four multiplications and one addition. All this is done in a few seconds; much more rapidly than if a skilled mathematician had taken the pen. But Inaudi is not merely a calculating machine, for he is also capable of doing the work of a true mathematician and of finding by arithmetic and tentative methods the solution of problems that are usually solved only by algebra. The manager insists upon this point, and he is right, and he adds that it has been thus only for the last two years. From this point of view, Inaudi has solved in our presence quite complex problems, which, worked out in this way, necessitated more than sixty successive operations that seem to pass before his eyes with amazing rapidity, like the figures of a kaleidoscope incessantly in motion. The difficulties that he has recently surmounted in this sort of exercises at the Academy of Sciences before the eyes of Messrs. Darboux, Bertrand, and Poincaré, at the Sorbonne, and at the minister's office in the presence of the minister of public instruction, Mr. Bourgeois, are truly colossal. The strongest mathematicians of our time, even Mr. Poincaré, whose competency in such matters is well known, have been obliged to recognize the fact. Let us add, further, that he is capable of retaining figures for months, provided that it is profitable to do so, or that he wishes to for any reason whatever. Then he classifies them in a special manner. It takes him a minute to commit to memory a number of twenty-four figures. Inaudi has had several predecessors, and it is not the first time that the members of the Academy of Sciences have studied analogous prodigies. As long ago as 1840, Henri Mondeux, a young calculator, was presented to them. Like Inaudi, he was a young shepherd. Born in the neighborhood of Tours, of poor parents, Mondeux from his earliest childhood had amused himself in counting pebbles while guarding sheep. He combined with them the numbers that he represented in this way, but he was unacquainted with figures. After having for a long time practiced alone in the fields, he offered to those whom he met to solve various problems. Mr. Jacoby, a teacher, remarked him and had him instructed, and a short time afterward took him to Paris and presented him to the Academy of Sciences. The mathematician Cauchy made a report upon him, in which he expressed his admiration to the highest degree. Mondeux was exhibited to the public in his shepherd's costume. He wore a blue blouse, a soft hat, and wooden shoes. A little before this the Academy had examined a twelve-year-old child, Vito Mangiamel, who was born in Sicily. Arago proposed some difficult problems to this child, who solved them mentally with the greatest ease.

"Lightning" calculators may claim as their ancestor the Englishman, J. Buxton, who toward the middle of the last century enjoyed a great celebrity. He, too, was an illiterate person, who began his reputation in his childhood. He calculated the longest and most complicated interest accounts.

Prof. Charcot, who submitted Inaudi to a close examination, was struck with the almost absolute identity of the conditions of birth and precocious development exhibited by "lightning" calculators. Almost all of them have drawn their extraordinary aptitudes from themselves, and have been illiterate. There is here a natural gift, as is, in a way, that wonderful gift that we call genius, and which inspires great artists or great mathematicians.—*La Nature.*

A HYDROSTATIC PARADOX.

R. W. WOOD.

A very pretty and instructive experiment, which I have never seen described, consists in floating a vessel with a hole in the bottom in a fluid specifically lighter than the material of the vessel.

An ordinary glass funnel, open at both ends, is made to swim in what appears to be pure water.

The effect is very startling, and even after the conditions are told, the exact cause may not appear to every one. To perform the experiment, fill a beaker six inches high to within an inch of the top with pure water. By means of the funnel, which should be of the same height as the beaker, pour ordinary sulphuric acid (the c. p. is better, being clearer) into the beaker until the water reaches the rim. The funnel should reach to the bottom while the acid is being poured in, and the heavy fluid will remain in a layer underneath the water. The surface of the acid should be stirred a little, so as to cause a partial mixing and render the dividing line more obscure. Then remove the funnel. By placing the glass in a suitable light, it will be next to impossible for a person to see the dense layer at the bottom. Call attention to the fact that there is nothing in the neck of the funnel to prevent the entrance of the water, and lower it into the beaker, where it will float in a most curious manner, and if pressed down a little, will bob up like a cork. The reason is obvious. As the funnel is lowered into the glass, the water rises in the tube and the level remains constant inside and outside, but as soon as the stem of the funnel dips into the heavy acid a change of level commences, for the downward pressure of the water outside will not support a column of acid its own height, and consequently the level of the liquid within the funnel falls below the level of the liquid outside. This difference of level has practically the same effect that a plug in the bottom of the stem would have; the head of the funnel being nearly full of air, it floats just as any hollow glass vessel would. In a beaker filled with sulphuric acid alone the funnel would sink, the glass being heavier than the acid.

The experiment is a very pretty one for the lecture table, and the exact cause of the phenomenon will prove rather a severe test for an elementary class.

A tubulated champagne glass, with the bottom cut off, may be used instead of the funnel, and I think likely that a saturated solution of hyposulphite of sodium could be used instead of the acid. It certainly would be safer.

If, while the funnel be floating, one pours sulphuric acid into it slowly, it does not sink, but *rises higher out of the water*, for the acid expels the water that entered during immersion, from the stem, and consequently decreases the length of the column necessary to support the funnel. If, on the other hand, water be poured into the funnel, it will sink at once, for the water cannot get down past the heavy acid in the bottom of the stem, and consequently fills up the head.

Baltimore, Md., March 14, 1892.

ROPE TRACTION FOR CABLE RAILROAD PLANTS.

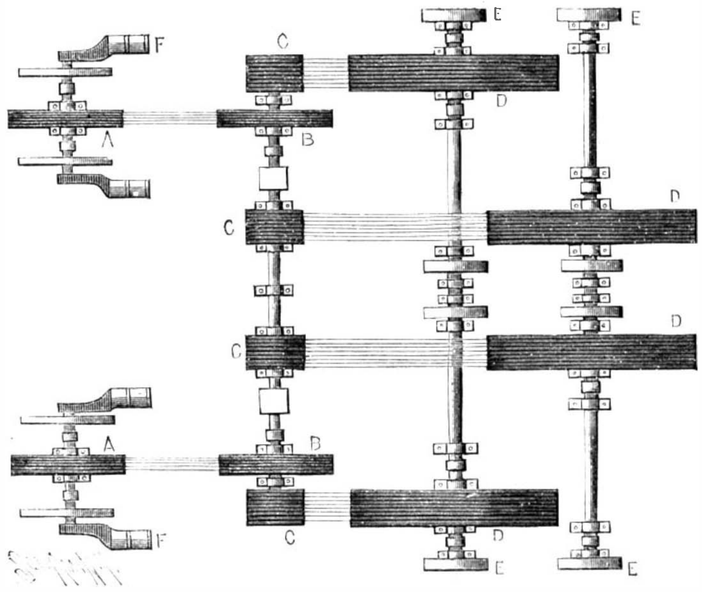
The great rope drive wheel shown in the accompanying illustration is one of four of the same size made by the Walker Manufacturing Co., of Cleveland, Ohio, for the Third Avenue Cable Railroad. These wheels are each 32 feet in diameter, 6 feet 1 inch wide on the face, and provided with 22 grooves each suitable for a 2¼ inch cotton or hemp rope. The finished weight of each wheel is 75 tons.

The connecting flanges of the segments of the rim are placed in line with the arms, and turned bolts fitted into reamed holes serve to secure these segments together. The arm ends are secured to the flanges on the segmental rim by through bolts, a portion of which are turned, fitted into reamed holes.

The centers, which present a very massive appearance, are accurately faced to receive the flanges of the arms, the connection being made by through bolts, half of which are turned bolts fitted into reamed holes. The wheel is shown in the lathe in which it was held for the making of the grooves in its face, the wheel being turned by a supplemental wheel clamped to its hub, while the supplemental wheel was turned by bevel gear connections. Other wheels of various sizes, ranging in diameter from 9 feet up to 22 feet, are being made by the company for the same work. The down town power house of the Third Avenue Cable road will be at the corner of the Bowery and Bayard Street, and at each of the power stations the entire plant will be duplicated to prevent any possible delay from breakdowns.

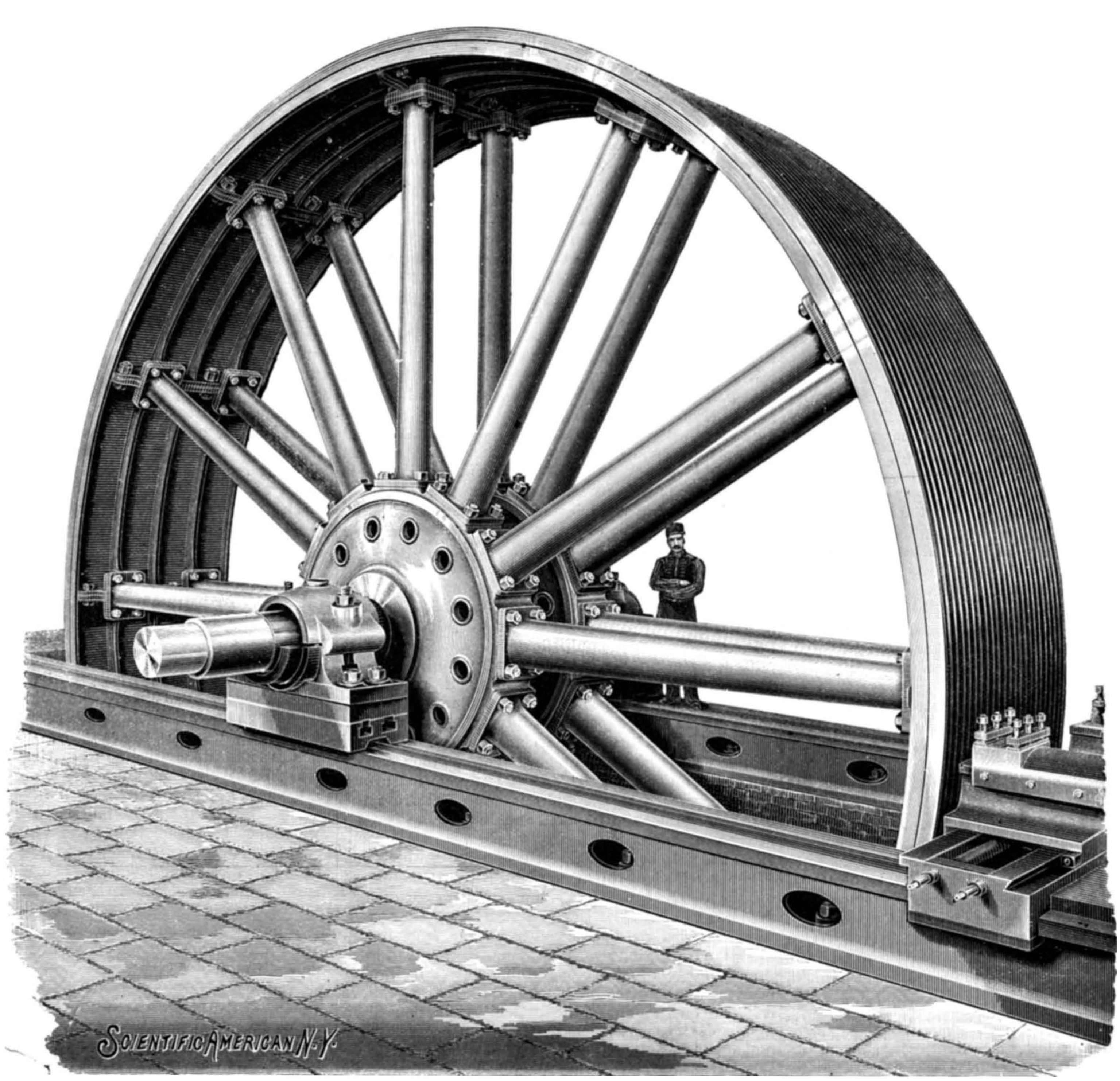
The Walker Manufacturing Company are also now making some similar rope wheels for the Broadway Railway Company, but these wheels will be still larger, being 32 feet in diamater and 8 feet 4 inches wide over the face, weighing over 100 tons each. The accompanying diagram of the Houston Street power station of the Broadway road, work on the foundations for which is now progressing, shows how these rope traction wheels are employed. The power plant is to be on one floor, all beneath the street level, and it has been necessary to excavate to a depth of 40 feet to obtain the room which will be required for the machinery. There are to be four engines of 1,000 horse power each, arranged in pairs. Each pair of engines, F, operates a shaft on which is a rope traction wheel, A, but a clutch mechanism allows either of the engines to be disconnected. A series of ropes transmits the power from A to the similar wheel, B, on a transverse shaft, this shaft also being similarly connected with the other pair of engines, and the arrangement being such that either one of the four engines may be employed to operate the shaft.

The smaller rope traction wheels, C, on the transverse shaft, are connected by a similar series of ropes with the large wheels, D, on shafts carrying the cable drums, E, on their outer ends. This means of conveying power from the engines to the cable drum shafts is not as rigid as would be a system of gears, and runs with far less friction, while some decided advantages are claimed for it over belt traction. The portion of the cable coming in is always under a higher tension than the portion of the cable which is going out, and this arrangement of rope-driving wheels is designed to give a certain elasticity to the system which will better accommodate the differences of tension than would be accomplished with either leather belt or cog wheel power transmission. There will be two entirely separate cables laid, the cars being provided with duplex grips, by means of which a change can be quickly made from one cable to another, should any accident occur by which the running cable is disabled.



A, B, C, D, Rope Pulleys from Engine, F, to Cable Drum, E.

POWER TRANSMISSION BY ROPE PULLEYS TO CABLE DRUMS.



A GREAT ROPE TRACTION WHEEL FOR THE THIRD AVENUE CABLE RAILROAD.

The Artificial Coloration of Flowers.*

The excitement about blue carnations led my neighbor, Mr. W. Dorrington, and myself to endeavor to solve the mystery by imitating it, and we soon discovered that, although flowers could not be tinted by immersing them in dye solutions, they could readily be colored by placing their stalks in aniline solutions.

Aniline scarlet dissolved in water to about the transparency of claret has a very rapid action on flowers, coloring them pink and scarlet. Indigo carmine produces beautiful blue tints. The two combined dye various shades of purple, with curious mottled effects, some parts of the flowers becoming pink and other parts blue and purple. Greens are produced by using the blue dye with yellow. We also tried indigo and cochineal, with partial success. Lily of the valley flowers became beautifully tinged with pink or blue in six hours; narcissi are changed from pure white to deep scarlet in twelve hours, and delicate shades of pink are imparted to them in a very short time. Yellow daffodils are beautifully striped with dark scarlet in twelve hours; the edges of the corona also become deeply tinged, and the veining of the perianth becomes very strongly marked. Cœlogyne cristata, lapageria alba, calla æthiopica, cyclamens, snowdrops, leucojums, hyacinths, Christmas roses, Solomon's seal, tulips, and many other flowers were successfully treated, and many leaves were found to become colored very quickly by the process. I send you herewith a number of examples.

The more interesting question of how this rapid change is brought about soon attracted my attention, and proved extremely interesting. The coloration is mainly confined to the vessels.

There is a system of veins in plants, the vein tubes being clearly seen under the microscope passing through the leaves, petals, and other parts of the flower. In these tubes the motion of the colored water can be seen, and it became evident that it was by these that the color is conveyed and left in every portion of the plants. In the case of cut flowers, the action is very rapid, the water tubes beginning at once to absorb the fluid, which was passed along by either capillary attraction, contraction, or possibly by some more active life-force acting within the veins. My experiments in proof of this were made at first entirely with cut flowers. I afterward tried the experiment by taking a Roman hyacinth very carefully out of the soil, and placing the roots in aniline water. In twelve hours the petals began to color, and the flowers gradually became pink tinted throughout. This experiment was repeated on many narcissi and other bulbs. It cannot, however, be said that the root fibers were unbroken; probably they were so, as I have failed to color any flower by merely watering the soil with colored water. The filtering appendages to the roots evidently prevent the absorption of much of the color, as the petals of the flowers do not become either so quickly or so deeply tinted when the plant has its root as with cut flowers. It was, however, clearly seen that the vein tubes proceeded from the roots, thus completing the water system of tubes from root to flower.

The veins when colored are beautifully seen under the microscope as clear tubes running in parallel lines, the interspaces filled by cellular matter. The tubes gradually branch out as they proceed, and as they approach the margins they are often finely branched. When the colored water reaches the margins of the petals they thus become deeply tinctured, especially in the narcissi, illustrating the cause whereby the daffodil so frequently obtains the deeper color at the edge of the corona. It is the same with the leucojum and the snowdrop.

Very singular results were obtained in the variegated leaves of the aucuba and ivy—plants which, at this winter season, one would suppose, had the leaves quite dormant. Single leaves, with their stalks placed in aniline dye water, began to color in about three hours, and in twelve hours had their margins deeply colored. They were thus shown to have the absorptive power, quite apart from the stem.

Another remarkable instance was seen in lapageria alba, which has a very thin wiry stalk and a large waxy flower. With the stalk placed in dye water, the whole flower became beautifully veined with pink in three or four hours—a singular fact, when one considers the minuteness of the tubes through which the liquid has to be drawn. It is difficult to believe that this can be accomplished by capillary attraction only. In eucharis amazonica, which has thick stalks, the flower does not become tinted at all, but the style is dyed a deep red. The pistils of flowers always become deeply colored, which is an important fact, showing that the solid matter of the coloring solution is thus secreted [deposited in] by the fruiting vessels of the flower.

White tulips furnish excellent illustrations of artificial coloring, as they can be readily tinted either pink, blue, green, or purple in a few hours. The vein tubes which are thus displayed in the petals agree with the strongly marked features, known as the "flamed" or "feathered" varieties of the florist. It is generally known that all tulips raised from seed are self-colored when they first bloom; they are then called "breeder tulips," and the enthusiastic amateur florist grows on his "breeders" for six or seven years until they "break," when they become either "flamed" or "feathered" varieties. Now a florist may ascertain in six hours whether his breeder tulip will become a feathered or a flamed sort, and whether it will be worth growing on for the breaking time, because the veining of the petal is shown by the color, and it is that which makes the feature when the tulip is fully matured. Blue tulips have always been desired, and they can thus be artificially produced for florist purposes.

Daffodils and narcissi generally can be greatly varied in color, and especially by showing their exquisite veining when thus treated. The tube and corona take a darker and richer tone of color than the perianth, thus agreeing with the fact that all daffodils are more or less bicolor. The Christmas rose is also an interesting flower when artificially colored. Straight tubes cross the petals from base to point, with numerous cross tubes, and the main ones branch out angularly, thus dividing the snow-white petals into a network of red lines. The interspaces are filled with oval cellules, and as the tubes are permeable, the cellular spaces become suffused with a delicate shade of pink. Snowdrops and leucojums are also very interesting when thus treated. Their petals are veined with about eight tubes at the base, which pass across the petal to its point in nearly parallel lines, strongly and clearly marked. These are branched near the tip of the petal in fan-like form, producing rich pink margins to the flower. The double white camellia is another very pretty illustration, as it easily assumes a pink shade throughout. It is difficult to imagine how this is done, as the camellia has a small woody stalk; and in the case of a double flower, with forty or fifty petals, the attachment of each of them to the tubes in the stalk must be very slight, and yet every petal becomes tinted in a few hours.

White lilac takes the color perfectly, becoming either pink or blue at pleasure. The abutilon has the calyx colored, but not the petals. These are already strongly vein marked, and they seem to refuse the new comer. Primulas take the color readily, but the common wild primrose will not be changed. Forced leaves of the Swede turnip, grown in the dark for culinary purposes, are extremely susceptible to coloration. They begin to color in about three hours, and in twelve hours are beautifully fringed with red, and suffused with rich orange. Thus tinted, they are beautiful objects for table decoration.

*Wm. Brockbank in the *Gardeners' Chronicle* of March 12. The editor adds: "Botanists have long since availed themselves of colored liquids to ascertain the course of the juices of plants, and the particular tissues through which the current passes, but our correspondent gives some details of much interest at the present time, and the specimens he sends exceed in interest any that we have before seen. To the botanist they are of special value, as showing so clearly the course of the vessels. The value to the florist is also curiously illustrated in the case of the tulip."

How Paper Barrels are Made.

This interesting process, which is the invention of Mr. J. R. Thame, is being carried out by the Universal Barrel Company, London, at their works at Boxmoor, Herts. These premises, which are known as Two Waters Mill, possess a special interest, inasmuch as they constituted one of the first paper mills in England, having been built during the reign of Queen Elizabeth. The process, which we were recently afforded the opportunity of inspecting, says *Iron*, forms another example of the utilization of waste, for the materials used are waste paper, cotton waste, leather waste, and, in fact, any waste substances of a fibrous nature. These materials are first sorted and are then slowly fed into a pulping machine, which consists of a beater running in a circulating tank of water, the waste being by degrees reduced to a fine pulp. When the pulp has attained a sufficient consistency it is run out into an accumulating tank on the floor below, in which is placed the apparatus for forming the bodies of the barrels.

In this machine the pulp flows into a tank and impinges against an endless traveling blanket, which picks up the pulp, the water draining off through the blanket. On the upper side of the blanket, and in contact with it, are placed, at intervals, the cylinders upon which the barrel bodies are formed. On these cylinders are placed sheet metal cores, which can be expanded and contracted, and it is upon the surface of these cores that the pulp is deposited from the blanket. Under the blanket, and in a line with each of these cylinders, is a pressure roller, which consolidates the pulp as it is deposited on the upper cylinder. When a sufficient thickness of pulp has accumulated on the cylinder, which occupies an average of four minutes, the metal core with the barrel body on it is taken off and the barrel body removed from it and placed in the drying room. And here it should be mentioned that this method of forming barrel bodies has been previously attempted in America. But we believe it failed on account of the difficulty experienced in removing the newly formed body from the core. This difficulty is overcome by Mr. Thame's ingenious contracting core. The drying room is heated by hot air circulated by a blower, and here the barrel bodies remain for a day, at the end of which time they are perfectly dry, and are taken to the trimming department, where the ends are trued up by saws, and afterward finished by hand, with sand paper. The bodies are then waterproofed by dipping them in a heated mixture of resin and resin oil. When dry the bodies are hooped up with a couple of American elm slips, and are ready for having the bottoms and heads fitted in and finishing.

The heads are made in two different ways. In one case they are formed from sheets of cardboard produced on a wood roller in the same way as the bodies, the paper cylinder being cut longitudinally and spread out into a sheet, which is dried, and out of which the heads and bottoms are subsequently stamped and finished off in the same way as the bodies. In the other case the heads and bottoms are formed from the pulp in a hydraulic press under a pressure of 750 lb. per square inch, and are finished in the same way as the others. In heading the casks a wood lining hoop is first fixed inside the body near the end, and the bottom is inserted and held in place by a second hoop on the top, the head being fixed up in the same way. The barrels are then painted ready for use. So far, the barrels we have been describing are plain cylinders, but bulged barrels of a superior class are also made, and for these the pressed heads are used. The bulged barrels are produced by placing the cylindrical body in an open-topped moulding press, the interior of which is of the necessary contour. Inside the body is placed an India rubber bag, connected up with the hydraulic main, and to which the water is admitted under the pressure before named. The pressure is kept on until the body has set to the desired form, when it is removed to the drying room to be dried and finished. All kinds of barrels are turned out, round as well as square, the latter being used for packing matches, but the barrels which were being made upon the occasion of our visit were plain cylindrical cement barrels, measuring 28 inches long by 16 inches diameter, and holding 3 cwt. of cement. The machinery is driven by an interesting example of steam engineering, namely, a compound beam engine of 30 horse power, bearing the date 1856. Steam is supplied by two Lancashire boilers, one of which is kept in reserve.

The works were started experimentally some four years since, and have been gradually developed into the practical working factory which to-day finds them. The present plant is comparatively small, there being only one body-forming machine. It is, however, equal to an output of 300 barrels per day of twenty-four hours. Besides the manufacture of barrels, that of cardboard is also carried on, boards of excellent quality being produced. An important feature of the manufacture is its economy, there being absolutely no waste. The cuttings and trimmings, and in fact all surplus material at every stage, is returned to the pulping machines. In one department we found an interesting application of the paper barrel to driving machinery. This was a 16 inch driving pulley, the rim of which was formed of a portion of a barrel body, while the arms and boss were made out of a pressed barrel head, the pulley working very well. For the paper barrels thus manufactured many advantages are reasonably claimed, among which are that they are strong, durable, and economical, that the parts are interchangeable, and that they can be made of any required tare, and to suit almost every purpose for which barrels are used. From all that we have stated it will be seen that in paper barrels we have not only an interesting process, but a practical manufacture which promises to prove a commercial success.

Ancient Cave Dwellers in Asia.

The Russians have made a singular discovery in Central Asia. In Turkestan, on the right bank of the Amou Daira, in a chain of rocky hills near the Bokharan town of Karki, are a number of large caves, which, upon examination, were found to lead to an underground city, built, apparently, long before the Christian era. According to the effigies, inscriptions, and designs upon the gold and silver money unearthed from among the ruins, the existence of the town dates back to some two centuries before the birth of Christ. The edifices contain all kinds of domestic utensils, pots, urns, vases, and so forth. The high degree of civilization attained by the inhabitants of the city is shown by the fact that they built in several stories, by the symmetry of the streets and squares, and by the beauty of the baked clay and metal utensils, and of the ornaments and coins which have been found. It is supposed that long centuries ago this city, so carefully concealed in the bowels of the earth, provided an entire population with a refuge from the incursions of nomadic savages and robbers.

To Clean Corundum Wheels.

Take one-third chloroform and two-thirds alcohol. The chloroform dissolves the wax and oil that accidentally gets on the stone; the alcohol removes the shellac and leaves the corundum free to cut as when the stone was new.—*Dr. Beacock, Dom. Dent. Jour.*

SERENO WATSON.

For the fourth time in the new year death has invaded the ranks of the National Academy of Sciences, taking Meigs, Lovering, Hunt, and now Watson.

Sereno Watson was born in East Windsor Hill, Conn., on December 1, 1826. Of his early life we have no record, but he must have shown evidences of studiousness, for he entered Yale College and was graduated in 1847, a member of the largest class ever graduated from that institution prior to 1863.

After graduating his mind seems to have turned to medicine, but the way was not clear, and so, for five years, he taught in various places in New England, in Pennsylvania, and in New York. Meanwhile at intervals he studied medicine, both at home in East Windsor and in the medical department of the University of the City of New York. Then for a time he served as a tutor in Iowa College, in Grinnell, Iowa, but this place he soon relinquished, and spent the years 1853–1855 in Quincy, Ill., where he completed his medical studies under the direction of his brother, Louis Watson.

He practiced medicine for a short time only, and in January, 1856, accepted the appointment of secretary of the Planters' Insurance Company, in Greensboro, Ala. This place he held until April, 1861. The civil war had then begun, and he retired from this office to return to the North. Subsequently he engaged in literary labors and for several years he was associated with Dr. Henry Barnard in editorial work on the *Journal of Education*, published in Hartford, Conn.

While in Alabama he became interested in botany, devoting his leisure to the pursuit of that interesting science, but it was not till later that he was able to return to it. In 1867 he went to California by way of the Isthmus of Panama. About this time the United States Geological Exploration of the 40th parallel was organized by Clarence King, under whom Dr. Watson received an appointment as a volunteer aid to the service. In March, 1868, William W. Bailey resigned the office of botanist to the exploration and Mr. King promptly nominated Dr. Watson to fill the vacancy.

He continued in the field until 1869, and then settled in New Haven, where he began the examination of the material collected in the herbarium of Professor Daniel C. Eaton, in Yale College, but a year later he removed to Cambridge and there completed his work in the herbarium of Professor Asa Gray. His results were published as Volume V., on "Botany," in the series of "Reports of the Geological Exploration of the 40th Parallel" (Washington, 1871). With the publication of this large quarto work his connection with the exploration came to an end.

His ability as a botanist was established, and much of the botanical work of the "Geographical and Geological Explorations and Surveys West of the 100th Meridian" was assigned to him by Professor Ferdinand V. Hayden. His results are scattered through the official reports of the survey and are known to his fellow scientists through his specially reprinted monographs. Again in 1880 the government sought his services and he was intrusted with the procuring of certain botanical information for the forest department of the United States census of that year. For this purpose he made a special visit to the great Northwest, in order to secure the necessary results.

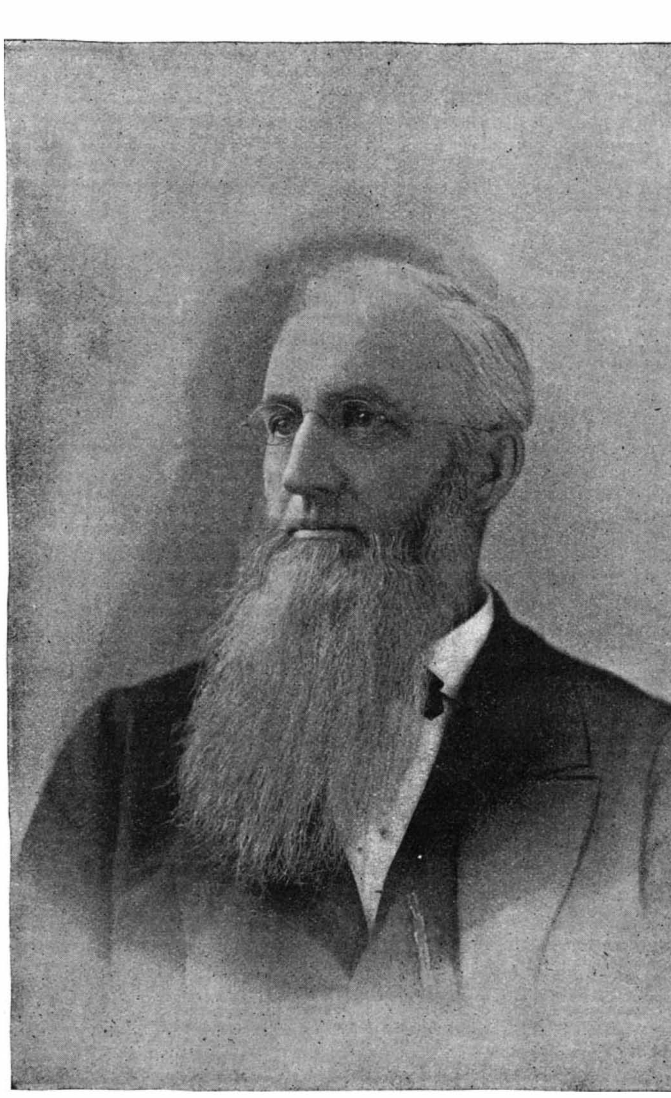
Meanwhile he continued to make his home in Cambridge, and in 1874, when the work of Dr. Asa Gray was divided among his assistants, the special charge of the herbarium was given to Dr. Watson. As curator he continued until his death. During 1881–1884 he also served Harvard as instructor of phytography. Subsequent to the death of Professor Gray, in 1888, the active prosecution of the systematic work at the herbarium was carried on by Dr. Watson. He took up the editing of the unfinished "Synoptical Flora of North America," and in association with Professor John M. Coulter, of Wabash College, Crawfordsville, Ind., he prepared a revised edition of Dr. Asa Gray's "Manual of the Botany of the Northern United States."

Of his own special work, the "Bibliographical Index to North American Botany," Part 1, Polypetalæ, was published in 1878 by the Smithsonian Institution, and in association with Professor William H. Brewer, of New Haven, and Professor Asa Gray, he prepared the "Botany of California," in two octavo volumes, issued in Cambridge in 1876 and 1880, as part of the series published under the auspices of the Geological Survey of California. The revising and editing of the "Manual of the Mosses of North America," originally prepared by Leo Lesquereux and Thomas P. James, was intrusted to him, and the volume was published in Boston in 1880.

Under the general title of "Contributions to American Botany," he published the results of special studies in his favorite science. These appeared for the most part in the "Proceedings of the American Academy of Arts and Sciences," and perhaps the most important were those devoted to the plants collected by Dr. Edward Palmer in Southwestern Texas and Northern Mexico. Besides these, he published occasional papers in the *American Naturalist* and other scientific periodicals. For a time he was one of the assistant editors of the "Century Dictionary," having special charge of the botanical subjects.

The great value of his work was appreciated by his scientific associates. In 1878 Iowa College, where as a young man he had been an instructor, conferred upon him the honorary degree of doctor of philosophy, and in 1889 he was chosen to the National Academy of Sciences, taking the place made vacant by the death of his older colleague, Dr. Asa Gray. He was one of the resident fellows of the American Academy of Arts and Sciences and in 1873 he became a member of the American Association for the Advancement of Science, at the Portland meeting. Two years later he was advanced to the grade of fellow. Dr. Watson was also a member of other scientific bodies, both in this country and abroad.

At the meeting of the National Academy of Sciences, held in New York during November, he was present, and apparently in good health, but, toward the close of the year, he became a victim to the prevalent epidemic form of the influenza, from which he failed to recover. A complication with dilation of the heart ensued, and, on March 9, he died at his home in Cambridge. His funeral services were held a few days later in Appleton Chapel.



SERENO WATSON.

At the time of his death, Dr. Watson was the fifth oldest active officer of Harvard University, but his retiring disposition prevented his being known personally to but few. He was absorbed in his particular duties at the herbarium, and seldom met others than those who were interested in his work. His familiar figure will no longer be seen in the college yard, but his contributions to American botany form a monument to his memory that will last forever. M. B.

Chronic Arsenical Poisoning.

A good example of chronic arsenical poisoning on a large scale occurred in County Asylum, Berrywood, and a short account of it may be both interesting and instructive. In the endeavor to make the wards of an asylum bright and cheerful, and to do this at as little expense as possible, it is not improbable that the nature of the coloring materials used may be overlooked, and that some of the gastric and intestinal disorders which disturb the peace of mind of medical superintendents may be cases of arsenical poisoning. For a long period the nurses here were in poor health. First one and then another was laid down until, within a few months, nearly every nurse on the staff had been, or was, under medical treatment. Headache, neuralgias, gastric derangements, loss of appetite, constipation or diarrhœa, irritation of eyelids, anæmia—these were the chief symptoms complained of. Drugs did not appear of much avail, but a holiday had a marked effect for good. At last one nurse had the eye symptoms in a more pronounced form, and suspicion was aroused. In each nurse's room was a green baize curtain, used as a covering for dresses, etc. A portion was taken and examined. It was found to be impregnated with arsenic to an astonishing extent. These curtains were removed; the rooms freely ventilated; medical treatment was stopped; the symptoms disappeared, and, though some months have elapsed, have not returned. The baize was similar to that used for covering doors, etc., and was obtained from two manufacturers.—*W. Harding, M.B., in the Lancet.*

Plate Glass Manufacture in Belgium.

According to the latest published statistics (1888), there were in active operation in the kingdom of Belgium 64 factories and 153 furnaces manufacturing glass of all kinds, employing 17,240 workmen. The value of the yearly production was 35,[illegible]65,000 francs.

In the consular district of Brussels there are eight plate glass manufactories, as follows: Societe Anonyme of Floreffe, at Floreffe; Societe Anonyme of Monstier, sur Sambre; Societe Anonyme of Anvelais, sur Sambre; Societe Anonyme of St. Roch, at Anvelais; Societe Anonyme of St. Marie d'Origines, at Tamines; Societe Anonyme of Hainaut, at Roux; Societe Anonyme of Charleroi, at Roux; Societe Anonyme of Courcelles, at Courcelles.

The average monthly production of each manufactory is 12,000 square meters. The average monthly production of the eight manufactories is 100,000 square meters, and per year 1,200,000 square meters, or 12,000,000 square feet, English measurement.

Crystal and mirror plate glass is not manufactured in this consular district, but is largely imported from Furth, Germany.

Ninety per cent of the crystal and mirror glass is made from blown window glass, which is first made into thick cylinders, which are smoothed and polished by machinery until the desired thickness is obtained, which varies from one-eighth to three-sixteenths of an inch.

The method employed in this district for grinding, smoothing, and polishing plate glass is as follows:

The glass, when taken from the furnace, is spread upon a cast iron table; the mass is then rolled into sheets of from 9 to 10 and from 14 to 16 millimeters in thickness. The former is designated as thin, and the latter as thick, plate glass. This operation constitutes what is known as rolling, and the glass thus produced is called rough glass. After the glass has been completely cooled, it is placed upon cast iron tables, upon which a bed of plaster of Paris has been prepared to receive and firmly hold the glass in place. Particular care is exercised in filling in the spaces between the glass and the table with the plaster, so as to securely seal the glass to the table. It then passes through a series of grinding and smoothing operations until the thickness is reduced to about one-fourth, and the face of the glass has been thoroughly polished. It is removed from the table, turned, replaced, and polished in the same manner as above described.

The operation of smoothing and polishing costs 6·50 francs ($1.25) per square meter. The cost of the rough glass is 7·50 francs ($1.45) per square meter. The total cost of glass when finished to a marketable condition is 14 francs ($2.70) per square meter (10¾ English feet).

JACKSON PARK will retain as one of its permanent attractions the building which Japan will erect for its headquarters at the Exposition. The building will be modeled after one of the most famous and architecturally unique of Japan's ancient temples, and with its surrounding garden will cost $70,000. About 40,000 square feet will be occupied. The South Park commissioners have accepted the offer of S. Tegima, representative of the Mikado, to give the structure to Chicago on condition that it be kept permanent and in repair, and that one room in it be devoted to a public exhibit of Japanese works of art, which the Japanese government agrees to replenish from time to time.

Sleeping Cars.

In one of the Pullman Company's suits for infringement, Mr. Jacob Shaffer testified that in 1837 he was employed in the car shops of the Cumberland Valley Railroad Company, and that sleeping cars, with hinged or folding beds, were then in use on that road. This defeats any broad claim to the use of such beds in cars.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

ELECTRIC SIGNAL. — Edgar C. Wiley, Bristol, Tenn. This invention provides an improvement on a former patented invention of the same inventor, being a circuit-closing device for use in connection with a system employing a rotary commutator. The invention consists of a peculiar construction and arrangement of devices whereby a depressible bar acted upon by the car wheel is made to adjust the commutator to position for making the circuits, hold it in this position for a limited time, and then allow it to be restored to its normal position.

ELEVATED RAILROAD.—Elbert D. Wilson, Birmingham, Ala. In the railroad construction contemplated by this patent the cars may be propelled by a power in the car or by hand. Brackets projecting from a line of posts support a cable on the top of which grooved wheels are mounted to travel, a frame carrying the wheels, while upon a downwardly extending rod is hung a car, there being a gear wheel on the shaft of one of the grooved wheels, a spring-pressed pawl engaging the gear wheels, a lever fulcrumed loosely on the shaft of the gear wheel carrying the pawl, and a bell crank lever fulcrumed in the car and connected with the pawl lever.

Mechanical Appliances.

SAW SET. — James M. Basket, Leota Landing, Miss. This is a self-acting device in which the hammer is first raised against the action of its operating spring by pressing the handles together, and then released by a further pressing together of the handles to act on the saw tooth, an improved gauge being provided by which the angle of the saw and its teeth may be readily adjusted. The implement may be moved rapidly along the saw from tooth to tooth and operated by a quick succession of grasps, the quick block given the tooth not bending it to any great extent, but beveling it on one side.

WINDMILL LUBRICATOR. — Benjamin J. Sykes, Sykesville, Pa. This device consists of a vertically swinging can or receptacle and a discharge tube extending up through the receptacle, and having a horizontal fixed extension at its lower end projecting in the direction that the receptacle is to be swung, so that when the receptacle is swung upward the contents of the horizontal extension will flow into and through the tube. At any moment all the journals or bearings may be lubricated by simply tilting upward the lubricating can.

CLAMP. — Walter H. Robinson, St. Paul, Minn. This clamp comprises two arms pivoted on the same base, and each provided on its free end with a fork and a screw rod for moving the arms toward and from each other. The device is simple, and is more especially designed to facilitate the removal of the spring and cap in air brake cylinders or other similar devices, to clean the same, and to assist in replacing the spring and cap after the cylinder is cleaned.

Agricultural.

CORN HARVESTER. — Peter J. Garber, Potwin, Kansas. This invention relates to a harvester in which the wagon frame is provided with a detachable hinged and obliquely arranged knife, the device being applicable to an ordinary farm wagon. The improvement also consists in a peculiar construction of the knife and the means for connecting it to the wagon frame, and also in a carrier or shocker for the cornstalks, to receive and transport them to the side of the field, the land being left ready for the plow.

TOBACCO HANGER. — Horace L. Freeman, Lexington, N. C. This is an improvement in hangers which consist of a portable supporting stick and a series of arms or needles pivoted thereto and adapted to swing, to fold against or swing outward from the stick. Each arm or needle has two adjacent eyes and is pivoted at such points to two parallel sticks or stick sections, which are movable relatively to each other to adjust or allow adjustment of the arms or needles, for opening them outward or folding them inward.

THRASHING MACHINE TABLE.—Joseph B. McChesney, Dane, Wis. This table is made in two longitudinal sections, connected by hinges on the under faces of the table, and the inside edge of the inner section of each table is connected by hinges with the side extension beam of the hopper of the machine, or with any other projection at the delivery end of the hopper. The table is capable of being supported in a horizontal position when required for use, and of one section being folded upon another, and both sections made to occupy a vertical position close to the thrasher when not in use.

CENTRIFUGAL HONEY EXTRACTOR.—Charles W. Metcalf, Santa Paula, Cal. Vertical shafts are journaled in the ends of the arms of a frame mounted to turn in a vessel, there being swinging comb holders supported on the shafts, a pin turning and forming a bearing for one end of the frame, a sprocket wheel on the pin and means for imparting a rotary motion thereto. The filled honeycombs can be readily inserted and the empty ones removed from this extractor, and the complete extraction of the honey from the inside and outside of the comb is assured.

Miscellaneous.

BADGE. — Charles A. Tripp, Brattleborough, Vt. This is an improvement in ornamental badges or pins to be worn upon the clothing, the invention providing a simple and secure fastening for the badge, so that it cannot accidentally become detached. The fastening consists of a spiral and a hook projecting from the back of the badge at opposite ends, and is adapted to hold the badge on the clothing in such way that it will be displayed to advantage.

CATAMENIAL SACK OR BANDAGE.—Emma H. Carpenter, Springfield, Vt. This bandage is made with side rolls having a tape fastened in the center of each roll, so that strain is relieved from the material of the bandage, and a novel arrangement of belt straps and tapes is employed to apply the bandage to the person.

WAGON TOP. — William Leonhardt, Baltimore, Md. Combined with the supporting standards is a collapsible or folding canopy frame composed of two horizontal rails and a series of short bows pivoted to the rails, all adapted to fold, with means for holding the bows in a normal vertical position. By this improvement the canopy or upper portion only of the wagon top is adapted to fold, the body or main portion being supported rigidly, although made removable from the wagon body. This improved top may be easily and quickly lowered to enable the wagon to pass under barriers.

OIL RESERVOIR. — Frank W. Mosby, Jr., Birmingham, Ala. This invention relates more particularly to an improved tank adapted for use upon locomotives, the tank being provided with a heating chamber whereby the oil is always maintained in a fluid state. The tank consists of independent oil chambers, each provided with a cover, supply vent, and discharge pipe, a heating chamber being arranged adjacent to the oil chambers, and a steam pipe entering the heating chamber. If desired, the tank is to be surrounded with a wooden casing.

CHECK CONTROLLED LOCK.—James R. Buckingham, Mount Vernon, Ohio. This is a simple and efficient lock to hold articles such as umbrella handles, canes, billiard cues, etc., and which may be unlocked by dropping into the lock a check especially adapted to the lock, and which releases the locking mechanism. In the lock case is pivoted a swinging crooked lever having an arm adapted to fit upon an article to be locked up, a locking lever having a shoulder engaging the crooked lever, and a releasing catch at one side of the lever adapted to release a check.

SEWING MACHINE ATTACHMENT. — Mary L. Birdsong, Arco'a, Miss. This is a device for attachment to machines operated by a treadle or pedal. It is a simple and readily applied removable hand lever attachment for the treadles, comprising inclined spring arms provided with a handle at their upper ends and having their lower ends bent to receive and clasp the edges of a treadle, whereby the machine may be readily run by the hand instead of by the foot of the operator.

RULER. — Victor M. Ariza, Maracaibo, Venezuela. This is a ruler for the use of draughtsmen and others which is designed to avoid the blotting and soiling of the paper by any ink that may accidentally get on the ruler, there being also a stop for indicating the length of the lines and mechanism for spacing. The casing is semi-cylindrical and provided with an absorbent lining, a roller fitted to the casing touching the lining, a pawl and ratchet mechanism turning the roller, and there being a scale and an adjustable arm for gauging the length of the lines.

CHECK PERFORATING MACHINE. — Albert R. Abbott, Boston, Mass. This is an improved machine for perforating dates and amounts in checks or documents of all descriptions. The invention provides a means whereby a table may be conveniently slid beneath any one of a series of punches to present a check, and the punches be expeditiously and conveniently operated, while the machine has a feed at once simple and positive, which may be readily thrown out of gear to receive the check or paper and will automatically return to its normal position, in clamping engagement with the article to be perforated.

PENCIL SHARPENER. — Orton H. Robinson, Grand Rapids, Mich. This sharpener comprises a tube having a longitudinally extending slot the side edges of which are sharpened and converge toward one end of the tube, the tube admitting or receiving the end of the pencil at an angle thereto for rotary action first against the diverging ends of the cutters formed by the sharpened edges. The pencil is sharpened by passing its point end through the oblique slot, and turning the pencil while the sharpener is firmly held. When the pencil is not in use the sharpener may be slipped over its pointed end to form a point protector.

INK BOTTLE.—William F. Hall, Rapid City, South Dakota. This bottle has an externally threaded neck in combination with an internally threaded thimble adapted to be screwed on to the neck of the bottle, and having an outwardly projecting flange at its upper end for supporting it in an aperture of the desk top. The bottle is particularly adapted for use on school desks, affording means for securing the filled bottle in an aperture in the desk, the mouth of the bottle being located flush with the upper surface of the desk top and the body of the bottle being hung in the desk.

SPRAYING DEVICE.—William J. Ruff, Quincy, Ill. This is an improvement on a former patented invention of the same inventor, forming a simple and durable device in which the sprayed liquids will be well mixed and which will not be liable to clog. The casing has two different sized compartments, a spraying nozzle being held on the end of the smaller one, and a spring-pressed piston valve held in the casing above the inlet opening and adapted to be seated on the part of the casing between the two compartments, while a valve carried by the piston valve projects into the opening of the spraying nozzle.

BARROW COAT.—Elise Halford, New York City. This invention relates to underwear for infants. The coat has a waist open at the front and provided with separable shoulder straps, a separate skirt open in front having the front edges overlapping one another, with means for fastening the overlapping parts, while a waistband attached to the upper edge of the skirt is adapted to be buttoned on the lower edge of the waist.

SHELF SUPPORT. — Henry M. Hart, Auburn, Ill. This is a support especially adapted for supporting the shelves of book cases, being so made that any shelf can be quickly and easily moved to bring it to a desired height in the case, even if the shelf is loaded. A semicircular plate attached to the under side of the shelf has curved slots in which slide curved spring-pressed bolts adapted to project from the end of the plate and extend into apertures in the end walls of the case, the bolts being withdrawn by pressing upon attached flush buttons.

FRUIT JAR COVER AND LOCK.—John B. Johns, Findlay, Ohio. This invention provides a cover and a bail lock capable of being quickly and conveniently applied to or removed from the cover, causing the jar to be hermetically sealed. The bail is pivotally connected with the jar, and the cap, having a transverse channel with teeth in its bottom and a locking lever, is eccentrically mounted on the bail, the lever having a semicircular surface with teeth for engaging the teeth of the cap.

BED SPRING. — Wilbur L. Gillette, Yalesville, Conn. This is a simple form of spring and support, very cheap and durable, adapted for attachment to any ordinary bedstead rail to support the slats, and form a cheap, simple, and easy spring bed. The bracket which supports the spring is adapted to be secured in the notches of the rail where the bedstead slats are usually inserted, and the spring, which is a common form of spiral bed spring, is readily so attached to the bracket as to be supported in a vertical position, while the upper end of the spring is doubled to form a keeper adapted to receive a slat.

HARMONY HARP. — George W. Ellsworth, Bowling Green, O. This is similar in all points of construction to the ordinary orchestral pedal harp, but reduces the number of strings to twenty-six and pedals to two. It comprehends all the keys of music both major and minor and by its peculiar stringing and tuning reduces performance upon it to the very minimum of ease. It is especially intended and adapted for a supplementary harmony instrument in large orchestra, dance, and street orchestra, and for accompaniments to vocal or instrumental parlor music.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention and date of this paper.

NEW BOOKS AND PUBLICATIONS.

The Ingersoll-Sergeant Drill Company, in their recently issued catalogue No. 8, present very full details of complete plants of mining, tunneling and quarrying machinery, together with a great deal of useful information touching a great variety of business of this nature. There have been many improvements made within a few years past in mining machinery and outfits, and this book represents the latest efforts in this line. It is profusely illustrated.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

INDEX OF NOTES AND QUERIES. No.

(4212) C. H. G. writes: We have in our school a barometer whose cistern is full of mercury. The mercury rises about seven inches when it should rise about twenty-six inches. Please state in the columns of your paper the cause and remedy for this. A. The barometer should be refilled. There is air in the tube.

(4213) A. A. writes: I never take up your journal without finding much to interest me. The letter on vision in the issue of March 12 leads me to ask if your correspondents or you will explain why the elevation of objects at a distance seems greater when the head is in its ordinary position upright than when it is turned to a horizontal position as when lying down. Look for instance at a distant mountain, and observe carefully its apparent height. Then turn the head down, so that the eyes, instead of being on a level with each other, are one directly above the other, and observe the difference in apparent height. Is this change due to the influence of some habit in estimating distances? And which appearance is more conformable to actual proportion? A. Such effects as you describe are due to changing parallax. In our ordinary position there is no vertical parallax; lying or the side there is vertical but no horizontal parallax, all which is due to the position of the eyes. Elevation ought to be more accurately estimated with the eyes in a vertical plane, i. e. with the observer lying on his side. But this again is offset by habit.

(4214) A. D. T. asks: 1. Will the same dynamo or the same electricity that produces an arc light produce an incandescent light? A. Many of the regular arc light circuits include incandescent lamps adapted to these circuits. Such lamps are used in series with the arc lights, and are each provided with a cut-out which automatically completes the circuit should the carbon filament break. It is common also to use arc lights of special construction in incandescent circuits. 2. Will the dynamo used for operating an electric street railroad produce an arc light? A. Yes.

(4215) F. O. B. writes: An experimenter would like to know if there is any kind of glue that will retain its cohesive qualities after being subjected to a continuous heat not exceeding three hundred degrees of heat, or is there any way to make a cheap combustible glue, something in the form of mucilage? A. Possibly a mixture of 9 parts glue and 1 part glycerine would answer your purpose. Sodium silicate (water glass) is somewhat adhesive and resists high temperatures.

(4216) W. P. S. writes: I have some gun cotton (soluble) which does not dissolve in alcohol or ether, and I would like to have you tell me through the columns of your paper what is the reason and how can I dissolve it? A. The trouble may be in the solvents. The alcohol may contain too much water. The alcohol and ether should be mixed.

(4217) E. A. asks whether there is any metal or composition that is softer than pure lead and is at the same time not very expensive. A. We cannot suggest any substitute for the purest lead, from the points of view of ductility and cheapness.

(4218) H. J. says: Would you please be kind enough to let me know through your valuable paper what the seven modern wonders of the world are? A. The wonders of this age or century are but faintly represented by the number seven, if you mean the wonders derived from science and engineering. Foremost stands the steam engine and its wondrous work in developing power. The development of electric power, light, and transmission of language in the telegraph, the telephone, the phonograph. Then the opening of celestial space by the great telescopes. The diving into the infinitesimal by the modern microscope. And as works of engineering, the Mont Cenis Tunnel, the Menai Bridge, the New York and Brooklyn Bridge, the St. Louis Bridge, the ocean telegraph lines, modern ordnance, the Atlantic racers, the transcontinental railways, and a long list of lesser works of note.

(4219) C. L. R. asks: What is understood by the term cellulose wool? A. We presume you mean the rough fibrous cellulose prepared from cocoanut husks and used for packing ships to prevent sinking when penetrated by shells. The fiber expands when wet and thus closes the hole.

(4220) W. E. T. asks: 1. I have a one-eighth horse power electric motor with a Siemens H armature, the fields wound with 2 pounds No. 16 wire, the armature ½ pound No. 18 wire; can I, by doubling the wire on the armature and winding in this way, make a plating dynamo? If not, what changes would be made? A. Connect the two arms of your field magnet in parallel and wind two No. 14 wires on the armature in parallel. 2. How are connections made in a dynamo so that current may be regulated with common switch, also to vary speed when used as a motor? A. There are two ways of doing this. According to one method, the field magnet is wound in sections and the switch cuts the current in or out. According to the other, a variable resistance is placed in the field magnet circuit, so as to introduce more or less resistance. 3. How is a dynamo constructed so as to give an alternating current? A. The coils of the armature are arranged to be brought under the field magnet poles of different name in alternation. Collecting rings are used instead of a commutator. 4. In an induction coil how are connections made so that a single cell runs the coil and any number of cells can be thrown in circuit? A. The cells are connected in series or in parallel according to the requirements of the coil, and a switch is provided which throws one or all of the cells into the circuit of the primary. 5. How is a rapid and slow vibrator for an induction coil constructed and connected with coil? A. A rapid vibrator is merely an ordinary vibrating armature like that of a vibratory electric bell. The slow moving interrupter is constructed on the same general principle, but the vibrating arm is made heavy, and the electrical contact is made by means of a mercury cup and a platinum wire attached to the vibrator. 6. How is frosting done on plated ware? A. It is generally done by means of a brush formed of swinging sharp-pointed needles rotated in a lathe, the needles being brought into contact with the work by centrifugal action.

F. W. A. asks for an incombustible ink.—V. H. L. says: Will you please give simple directions for etching on copper?—R. M. C. says: Can you inform me of the method of making gelatin sheets?—G. M. F. asks for a receipt for liquid gutta percha.—B. B. S. asks for the general method of making perfumes and for reliable formulas for the various odors.—C. H. C. says: Can you give briefly some of the methods by which the dreaded phylloxera are destroyed?—S. M. W. says: Will you please give me the various synonyms of alcohol and ammonia?—J. G. S. says: Can you inform me where I can obtain tables for converting United States and metric measures?—H. B. R. says: Will you please give through the columns of Notes and Queries the formula for ground glass varnish used by photographers?—H. K. B. says: Can you tell me what soy is?—J. J. H. says. Have you a rule or table by which I can convert the readings of the Centigrade or Reaumur scale to the customary or Fahrenheit scale?—J. C. V. wants to know of what lithofracteur is composed.—O. D. E. says: How can I convert degrees Twaddell to specific gravity?—C. B. D. says: Can you inform me through your valuable paper of a cheap method of fireproofing timber?—E. H. V. R. would like to know the ingredients of material known as compose, used in place of plaster of Paris in casting center pieces and ornaments.—W. W. S. asks: Can prints or engravings be made on paper with printer's ink from a print or engraving on an ordinary newspaper?—L. B. C. would like to find a composition to cement wood to celluloid.—E. N. asks for a receipt for making skeleton leaves?

Answers to all of the above queries will be found in the "Scientific American Cyclopedia of Receipts, Notes and Queries," to which our correspondents are referred. The advertisement of this book is printed in another column. A new circular is now ready.

Replies to Enquiries.

The following replies relate to enquiries recently published in SCIENTIFIC AMERICAN, and to the number therein given:

(3980) H. McFarlen, Chicago, says: In the January 30 number of SCIENTIFIC AMERICAN, page 75, I find a question of inquiry, art. (3980), in which your inquirer asks if there is a machine for casting sash weights? Also, if it is practical to melt iron with petroleum. To both these questions I answer yes. I have at my establishment now a machine with moulds in which to cast sash weights. I have also tested in a small but practical way the melting of iron with fuel oil, and found it quite satisfactory.

(4092) W. M. B. in query No. 4092 asks for information in regard to black specks on silver prints. I have had some experience with them, and found their cause to be iron filings, probably introduced into the silver bath from the clothing after having been at the mechanic's work bench. Small particles of iron or steel make black specks, while brass makes a pale green speck somewhat larger and more nearly round than the black ones.—J. A. MCCLINTOCK.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

March 29, 1892.

AND EACH BEARING THAT DATE.

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

Adhesive fabrics, producing, B. Hochman........ 471,611
Air brake, H. McNulta........ 471,801
Air compressor motor, Burdon & Houston........ 471,766
Alarm. See Fire alarm.
Anemometer cup, H. J. Green........ 471,817
Animal trap, Watrous & Palmer........ 471,726
Annunciator, electrical, N. M. Watson......471,986, 471,987
Auger, earth, M. S. Franks........ 471,605
Axle box, car, I. H. Plummer........ 471,893
Axle boxes, dust guard for, H. M. Goodman........ 471,969
Axles, manufacture of channeled, O. C. Hall........ 471,544
Bale tie, H. C. Tully........ 471,628
Ball bats, cushion tip for, G. W. Hancock........ 471,545
Bar. See Car draw bar. Fire bar.
Barbers, combination case for, R. V. Russell........ 471,752
Barrels, mechanism used in the manufacture of, S. Wright........ 471,838
Battery. See Galvanic battery. Secondary battery.
Battery plate and making the same, storage, Donaldson & Macrae........ 471,538
Bed bottom, H. Reinhold........ 471,622
Beds, adjustable head section for, L. H. Steffey........ 471,764
Bedstead, T. R. Chambers........ 471,533
Bell, E. D. Rockwell........471,982, 471,983
Beverage, W. M. Myers........ 471,879
Bicycle, T. O'Brien........471,621, 471,651
Bicycle, S. Vale........ 472,005
Bicycle brake, W. T. Lewis........ 471,845
Bicycle handle, F. E. Youngs........ 471,932
Bicycle, saddle, O. Hanson........ 471,744
Bicycle, seat, Steers & Hunt........ 471,908
Binder, temporary, G. A. Piper........ 471,803
Bit. See Bridle bit.
Blinds, sashes, etc., attachment for, W. H. Boyle 471,939
Block. See Snatch block.
Blotter, Bang & Herbert........ 471,531
Bodkin, E. A. Willard........ 471,926
Boiler. See Wash boiler.
Boiler furnace, M. A. Foster........ 471,966
Boiler furnace, J. Leede........ 471,673
Boilers, supplementary heater for range, T. W. Rees........ 471,827
Book, J. E. Spears........ 471,863
Bookbinding machine, J. W. Clark........ 472,011
Book cover protector, adjustable, C. F. Morgan........ 471,843
Book, manifold copying, K. O. St. John........ 471,724
Bottle stopper, E. Ketterlinus........ 471,746
Box. See Axle box. Letter box.
Bracket. See Scaffold bracket.
Brake. See Air brake. Bicycle brake. Car brake.
Brake shoe, M. A. Penney........ 471,891
Brick kiln, J. C. Kinzel........ 471,769
Brick machine, H. W. Mead........ 411,677
Bricks, process of and composition for manufacturing sand, E. H. Lewis........ 471,844
Bridge gate, N. Bosmann........ 472,009
Bridle bit, N. Stalker........ 471,833
Brush fiber clamp, W. H. Gates........ 471,606
Brushes, machine for the manufacture of, G. Shaw *et al*........ 471,709
Burner. See Gas burner. Hydrocarbon burner. Oil or gas burner. Vapor burner.
Button, R. Sutro........ 471,911
Buttonhole cutter, M. Carmody........ 471,950
Calipering machine, automatic, P. Kammerer........ 471,557
Camera. See Photographic camera.
Cameras, magazine for, M. B. Feeney........ 471,715
Can. See Tin can.
Can, W. H. Atkinson........ 471,528
Can opener, A. B. Schofield........ 471,776
Can opener and painter's tool, combined, W. W. Minnerly........ 471,562
Candle, ornamented, T. V. Forster........ 471,992
Candles, machine for marking or ornamenting, C. Forster........ 471,991
Car brake, W. B. Flinn........ 471,635
Car brake, railway, R. C. Sayer........ 471,849
Car coupling, J. Dixon........ 471,843
Car coupling, G. W. Gardner........ 471,853
Car coupling, W. McConway........ 471,881
Car coupling, C. A. Pooley........ 471,568
Car coupling, J. W. Stout........ 471,910
Car coupling, F. L. Wells........ 471,702
Car coupling, Young & Moskowitz........ 471,729
Car coupling, automatic, A. J. Cleland........ 471,952
Car draw bar, T. Baril........ 471,530
Car heating apparatus, steam heater for railway, E. A. Leland........ 471,869
Car, passenger, C. L. Pullman........ 471,761
Car ventilator, J. Martin........ 471,649
Cars, running gear for street, S. Robertson........ 472,001
Cars, safety attachment for cable or electric, A. Haynal........ 471,750
Cars, switching attachment for street, O. W. Brenizer........ 471,714
Cars, trap door for railway, Snyder & McMahon.. 472,003
Carbureting apparatus, L. J. Phelps........ 471,773
Carpet or oil cloth protector, Shrum & Howarth.. 471,763
Carrier. See Harvester bundle carrier.
Cartridge, explosive, Butterfield & Batchelor..... 471,946
Case. See Package case.
Casing for cavities, C. Vetter........ 471,629
Casket handle, T. McGovern........ 471,771
Casting and dressing machine, type, J. G. Pavyer 471,890
Chair. See Railway rail chair.
Channeling machine, Z. Lassor........ 471,797
Checkrein, overdraw, J. McKenney........ 471,749
Cheese bandager, C. D. Hadcock........ 471,756
Cheese cutter, Gibson & Cameron........ 471,716
Chuck, lathe, J. F. Rouston........ 471,572
Churn motor, W. Omer........ 471,886
Clamp. See Brush fiber clamp. Wood clamp.
Cleaner. See Grain or coffee cleaner.
Clothes wringer, C. Wheeler, Jr........ 471,924
Clutch, S. B. Williams........ 471,589
Clutch mechanism for power presses, N. C. Stiles. 471,777
Cockeye, A. E. S. Howard........ 471,640
Coin freed or actuated machine, H. A. Burt........ 471,808
Coin receptacle and register, G. K. Cooke........ 471,536
Coking oven, H. Ekelund........ 471,692
Collar, horse, M. T. Burke........ 471,600
Combination table, T. J. Fearns........ 471,815
Commutator brush, R. Hirsch........ 471,792
Cooking utensil, Ross & Westcott........ 472,002
Cooler. See Milk cooler.
Corn and cob crusher and grinder, F. S. Rich...... 471,828
Corn popper, A. H. Gleason........ 471,994
Corner iron, inside, C. E. Hart........ 471,610
Cornice and eaves trough brake machine, Brown & Boggs........ 471,599
Corset, A. Bouchard........ 471,597
Coupling. See Car coupling. Hose coupling. Thill coupling.
Crane, hoisting, J. O. Richmond........ 471,898
Crimping machine, R. Whitaker........ 471,925
Crusher. See Corn and cob crusher.
Cultivator, C. E. Booi........ 471,841
Cup. See Anemometer cup.
Current motor, L. C. Neal........ 471,564
Curtain fixture, W. Doulin........ 471,962
Cutter. See Buttonhole cutter. Cheese cutter.
Damper, stovepipe, E. A. Hoefer........ 471,718
Dental disk holder, E. E. Park........ 471,887
Dental engine, Miller & Wells........ 471,877
Dental tool, Sweet & Parker........ 472,004
Developing dish, O. Francke........ 471,542
Diamido-diphenylmethan bases, making, E. Vongerichten........ 471,659
Diffusion apparatus, E. Gschwind........ 471,995
Digger. See Post hole digger.
Disinfecting apparatus, N. M. Dyer........ 471,603
Disinfecting device, N. M. Dyer........ 471,602
Ditching machine, S. Starr........ 471,834
Dock, permanent dry, W. E. Simpson........ 471,805
Door, electrically controlled trap, F. C. Callahan.. 471,947
Door hanger track, J. G. Lane *et al*........ 471,867
Door or window screen, M. J. Tenney........ 471,579
Drainer, F. A. Strater........ 471,578
Drawers, E. Walker........ 471,919
Dyes, making rosaniline, B. Homolka........ 471,638
Eaves or roof gutter, E. R. Densmore........ 472,014
Eaves trough hanger, W. C. Berger........ 471,936
Electric cut-out, automatic, E. A. Manship........ 471,997
Electric generator or motor, dynamo, C. W. & L. B. Atkinson........ 471,691
Electric light crane, J. Gallagher........ 471,968
Electric light support, J. J. Walsh........ 471,837
Electric lock, J. G. Thompson........ 471,913
Electric machine or motor, dynamo, Goolden & Atkinson........ 471,693
Electric motors or dynamo-electric machines, brush holder for, C. A. Hussey........ 471,819
Electric switch, H. Hubbell........ 471,612
Electric switch, C. G. Perkins........ 471,760
Electric telpherage apparatus, M. W. Hassan........ 471,790
Electric wire joint, R. H. Smith........ 471,625
Electric wires, pole for supporting, J. H. Huntress........ 471,759
Electrode, electro-therapeutic, H. Bonis........ 471,850
Electrode, secondary battery, C. F. Winkler...... 471,591
Elevator, J. A. Dean........ 472,012
Elevator safety device, E. W. Naylor........ 471,825
Embroidering machines, fabric holding frame for, J. Irish........ 471,793
Endless apron carriers, driving mechanism for, J. Dick........ 471,743
Endoscopic instrument, J. W. Daily........ 471,990
Engine. See Dental engine. Rotary engine. Steam engine.
Envelope for mailing packages, H. G. Mackinney. 471,846
Excavator, C. A. Warren........ 471,920
Exhibitor, merchandise, F. E. Bush........ 471,989
Extension table, F. P. Cobham........ 471,954
Eyeglass holder, G. Maier, Jr........ 471,734
Fans, means for operating rock, R. Wehrle........ 471,581
Fare registering device, M. Fortuno........ 471,540
Faucet, C. Ruchti........ 471,574
Faucet, beer, G. H. Walker........ 471,630
Feed trough, W. A. Leech........ 471,868
Fence, J. E. Dusang........ 471,682
Fence machine, C. H. Kellogg........ 471,979
Fence machine, wire, M. L. Jones........ 471,978
Fence strands, machine for making wire, E. F. Hathaway........ 471,669
Fence, wire and picket, J. Speakman........ 471,831
Fertilizer distributer, C. W. Nicholson........ 471,884
Fifth wheel, T. L. Bosart........ 471,806
File cover, court, A. E. Walkup........ 471,660
File or binder, temporary, H. George........ 472,018
File, prescription, G. L. Goodman........ 471,856
Filter, L. N. Blessing........ 471,840
Filter, W. M. Deutsch........ 471,811
Filter presses, plate for, J. P. Boetiger........ 471,741
Fire alarm, automatic electric, L. G. Woolley...... 471,929
Firearm, breech-loading, F. Sifuentes........ 471,904
Fire bar, movable, Heider & Schuscha........ 471,695
Fireproof construction, W. Orr........ 471,772
Fish hook, C. A. Haviland........ 471,548
Flue dust, apparatus for condensing, H. W. Hixon........ 471,860
Flushing tank, H. H. Craigie........ 471,537
Frame. See Slate frame.
Fuel, storage tank for liquid, C. A. King........ 471,615
Furnace. See Boiler furnace. Hot air furnace. Ventilating furnace.
Furnace door and boiler front, J. Fea........ 471,667
Galvanic battery, W. Burnley........ 471,945
Game, H. A. Doty........ 471,666
Game apparatus, G. B. Nichols........ 471,883
Game counter, A. J. Youlin........ 471,593
Gas burner, F. Leibman........ 471,799
Gas burner safety attachment, G. L. Thunen........ 471,914
Gas pressure regulator, automatic, J. G. Strub........ 471,657
Gas, process of and apparatus for making, J. Leede........ 471,671
Gate. See Bridge gate. Safety gate.
Gate, H. Barker........ 471,935
Gate, J. Elcock........ 471,851
Generator. See Electric generator.
Gold, silver, etc., machine for separating, J. B. Freeman........ 471,731
Governor, marine engine, E. F. Wallgren........ 471,725
Grafting, method of and device for, W. M. Rowell........ 471,573
Grain binder, C. A. A. Rand........ 471,826
Grain elevating and measuring machine, S. P. Ford........ 471,965
Grain or coffee cleaner, T. A. Seip........ 471,901
Grate, ventilating, S. Shaw........ 471,575
Grater, E. J. Blueher........ 471,937
Guest call, automatic, W. H. Perry........ 471,686
Gum moistener, A. Gartner........ 472,017
Gun, automatic magazine, J. M. & M. S. Browning........ 471,782
Gun, machine, J. M. & M. S. Browning......471,783, 471,784
Handle. See Bicycle handle. Casket handle.
Hanger. See Eaves trough hanger.
Harness girth, I. B. Ingle........ 471,554
Harrow, F. C. Merrill........ 471,719
Harvester bundle carrier, B. F. Stewart........ 471,737
Harvester, corn, W. G. Atwood........ 471,632
Harvester, corn, J. W. Parker........ 471,889
Hat rounding machine, C. H. Reid........ 471,751
Hay rake, horse, W. R. Mann........ 471,648
Head rest for beds, C. V. Reeves........ 471,895
Heater. See Vehicle heater.
Heater and shade, combined, F. Busch........ 471,742
Heating apparatus, C. A. Sawin........ 471,754
Hinge, J. H. Mahan........ 471,981
Hoisting machine, J. Cosgrove........ 471,955
Holder. See Dental disk holder. Eyeglass holder. Pen holder. Pipe holder.
Hones, composition for dressing, C. A. Praray........ 471,569
Hook. See Fish hook. Whiffletree hook.
Horseshoe, C. E. Howard........ 471,864
Hose coupling, F. W. Wright........471,661, 471,662
Hot air furnace, A. Brake........ 471,664
Hot air register, J. W. Collins........ 471,681
Hydrocarbon burner, H. T. Russell........ 471,721
Ice making machine, D. L. Holden........ 471,684
Indicator. See Station indicator.
Indicator lock, L. T. Crabtree........ 471,956
Insect exterminator, L. G. Tuttle........ 471,779
Insulated electric conductor, J. B. Williams, 471,587, 471,588
Iron. See Corner iron.
Iron or steel, determining the temper of, C. A. Casperson........ 471,809
Jar fastener, G. B. Valentine........ 471,917
Joint. See Electric wire joint. Rod joint.
Joint mould, J. C. Raymond........ 471,894
Kiln. See Brick kiln.
Knife, Walker & Peifer........ 472,006
Knitting machine feeding mechanism, S. L. Otis.. 471,566
Knitting machine, straight, A. Heidler........ 471,636
Knob attachment, W. F. & W. M. Morton........ 471,563
Lamp, W. S. McLewee........471,822, 471,823
Lamp filler, T. Hipwell........ 471,791
Lamp, pocket, S. G. Speir........ 471,985
Lamp support, electric, C. J. Klein........ 471,645
Lamps, bracket for incandescent electric, J. H. Goebst........ 471,7 2
Lamps, manufacture for incandescent electric, F. S. Smith........ 471,576
Lamps, mast-arm switch for electric, T. Dillon........ 471,730
Land roller, Mallery & Youngs........ 471,820
Lathe, Loveland & Henn........ 471,674
Lathe tool, R. A. Berger........ 471,839
Leaching solutions, purifying hyposulphite, E. R. Holden........ 471,550
Lead, making white, Waller & Sniffin........ 471,780
Letter box, house door, A. H. Van Pelt........ 471,918
Letter box, house door, S. Witherell........ 472,007
Liquid dispensing apparatus, J. C. Mayrhofer........ 471,821
Lock. See Electric lock. Indicator lock. Nut lock. Oar lock. Whip lock.
Lock, A. Arens........471,594, 471,595
Loom for weaving pile fabrics, Terry & Rawnsley 471,835
Loom, swivel, J. C. Brooks........ 471,665
Lubricator. See Sight feed lubricator.
Lumber sorter, F. S. Farr........ 472,016
Mashing machines, adjusting device for, C. Kaestner........ 471,613
Measuring caddy, Jones & Agate........ 471,670
Meat tendering implement, P. A. Hauser........ 471,973
Mechanical movement, C. B. Cottrell........ 471,786
Mechanical movement, J. G. Young, Jr........ 471,931
Metal foil packages, putting up, J. H. J. Haines.. 471,609
Metallic facing for buildings, L. L. Sagendorph.. 471,722
Milk cooler, Hoellings, Jr., & Evans........ 471,974
Milk cooler, O. Leonard........ 471,646
Miner's candlestick, F. Muenger........ 471,998
Mould. See Joint mould.
Monument, F. M. Hawkins........ 471,758
Motion, device for transmitting, G. S. Strong, 471,655, 471,656
Motor. See Air compressor motor. Churn motor. Current motor. Spring motor.
Mowers, cutter bar for, J. A. Noel........ 472,000
Music, extension key for transposing, J. Bracken. 471,713
Musical instrument, mechanical, C. Kretschmar.. 471,559
Musical tones by electro-magnetism, method of and apparatus for producing, E. C. Ohmart.... 472,019
Nail puller, M. Loftin........ 471,873
Nut lock, A. J. Gould........ 471,698
Nut lock, Mathie & Fletcher........ 471,875
Nut lock, D. C. Terry........ 471,627
Nut lock, safety, A. M. Krone........ 471,796
Oar lock, G. H. Haslop........ 471,546
Oil or gas burner, G. S. Sanford........ 471,753
Oils, refining, T. Drake........ 471,963
Ores, apparatus for desulphurizing, J. Leede........ 471,618
Ores, apparatus for treating refractory, J. Leede, 471,617, 471,672
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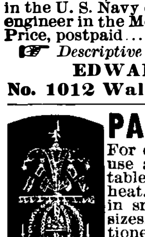

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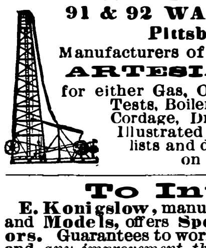

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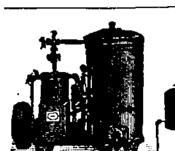

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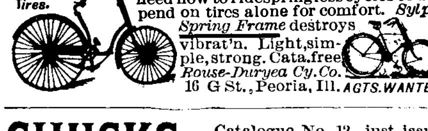

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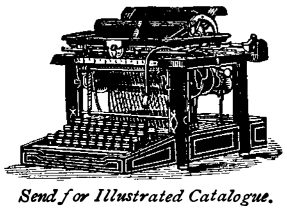

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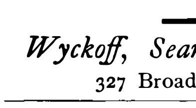

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