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WATERTOWN, N. Y., AND ITS WATER POWER.

One of the prettiest and industrially one of the most promising of the smaller cities of this State is Watertown, the county seat of Jefferson County. The basis of its industrial promise is the admirable and unfailing water power afforded by the several falls of the Black River within its limits, supplemented by the circumstance that it lies in the midst of one of the best agricultural districts of Northern New York, and adjacent to the great timber and mineral regions of the Adirondacks. Its shipping facilities are good, owing to abundant railway connections and its proximity to good ports on Lake Ontario and the river St. Lawrence.

Black River, whose falls furnish the water power which has given the city its name and much of its industrial development, rises in the heart of the Adirondack wilderness, and is the outlet of the southwestern portion of the lake region dear to health and pleasure seekers, hunters, and fishermen. With its branches it drains a territory of 2,000 square miles, mostly granitic, full of lakes and swamps, with a copious rainfall, making the flow of water abundant and sure at all seasons. For several miles above the city the river has a rapid course over a rocky bed—the Trenton and Birdseye limestones of the State geologists—and in purity and softness the waters are admirably suited for manufactures, especially of textile fabrics. Within the city limits are five distinct falls, which, with the rapids, make a difference of level of 112 feet. The average flow of water is about 400,000 cubic feet a minute, furnishing an actual (average) working energy of over 80,000 horse power. The available water power must certainly exceed a quarter of that amount—enough at any rate to make Watertown a very considerable manufacturing place.

The accompanying engraving represents the main fall of Black River, as sketched by our artist during a recent visit. This fall, 35 feet high, is on the north side of Beebee Island, in the very heart of the town. Its companion on the south side of the island is 20 feet high. The other falls are respectively 14, 13, 12, and 11 feet in height. Aside from the water which flows unused over the dams already built, there are sites for several other dams, with excellent mill sites in various parts of the city at which larger powers could be cheaply utilized. And it is a commendable feature in the management of these properties that a decidedly liberal spirit is shown toward those manufacturers who may wish to locate there. In some cases the owners of available water powers offer to donate water rights to such as will undertake to use them. There are also many places along the river above and below Watertown where the stream is rapid and narrow and well suited for mill sites.

Watertown has a population of about 12,000, and is one of the healthiest cities in the Union. Its manufactures include numerous tanneries, machine shops, foundries, engine works, grist mills, cotton and woolen mills, paper mills, lumber mills, and woodworking establishments, a large wagon factory, furniture factories, the Davis sewing machine factory, and many other establishments turning out lamps, car wheels, vacuum brakes, boots and shoes, stoves, tinware, and a great variety of industrial products.

WATER POWER ON THE BLACK RIVER AT WATERTOWN, N. Y.

The Arctic Winter.

Lieutenant Schwatka, the Arctic explorer, gives some interesting facts in regard to the character and duration of the Arctic winter. He says:

"The generally received opinion that the Arctic winter, especially in the higher latitudes, is a long, dreary one of perfect opaque darkness is not strictly correct. In latitude 83° 20′ 20″ N., the highest point ever reached by man, there are 4 hours and 42 minutes of twilight on December 22, the shortest day in the year in the Northern Hemisphere. In latitude 82° 27′ N., the highest point where white men have wintered, there are 6 hours and 2 minutes in the shortest day, and 328 geographical miles from that point must yet be attained before the true Plutonic zone, or that one in which there is no twilight whatsoever, even upon the shortest day of the year, can be said to have been entered by man. Of course, about the beginning and ending of this twilight it is very feeble and easily extinguished by even the slightest mists; but, nevertheless, it exists, and is very appreciable on clear, cold days, or nights, properly speaking. The North Pole itself is only shrouded in perfect blackness from November 13 to January 29, a period of 77 days. Supposing that the sun has set (supposing a circumpolar sea or body of water unlimited to vision) on September 24, not to rise until March 18 for that particular point, giving a period of about 50 days of uniformly varying twilight, the Pole has about 188 days of continuous daylight, 100 days of varying twilight, and 77 of perfect inky darkness (save when the moon has a northern declination) in the period of a typical year. During the period of a little over four days the sun shines continuously on both the North and South Poles at the same time, owing to refraction, parallax, semi-diameter, and dip of the horizon."

The Last of the Centennial Exhibition.

The Main Centennial Exhibition building of 1876 was sold at the Philadelphia Exchange, August 9, for $97,000. The building originally cost $1,600,000. In its construction 75,000,000 feet of lumber and 8,500,000 pounds iron were consumed. The structure was 1,830 feet long and 464 feet wide.

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NEW YORK, SATURDAY, AUGUST 27, 1881.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 295,

For the Week ending August 27, 1881.

Price 10 cents. For sale by all newsdealers.

"A MILITIA FOR THE SEA."

Under this title Mr. John Roach, in the August number of the *North American Review*, discusses the old but ever new subject—the weakness of our navy and the smallness of our foreign shipping trade. Probably there is no other one question in which the general public is so profoundly interested, for it combines the tariff with a leading point in governmental policy, and touches the national pride in a matter where we have especial cause to be sensitive. Every one is hoping that we shall soon have a change from the present situation, and the feeling is strong that some policy should be adopted to compass the desired end, but just how this can best be effected is by no means clear.

Mr. Roach brings forward a plan for the building of one hundred powerful iron screw steamships, with a speed of 15 and 16 knots, and of a burden of 2,500 to 4,000 tons, exclusively for the foreign trade, but of such special construction that all of them could, in thirty days' time, be armored with nine-inch steel plates. He would have the government encourage the building and running of these ships by American houses by the appropriation of three to five million dollars per annum in subsidies, and knows of one man who would then subscribe one quarter of the amount needed for the entire fleet. The vessels are to be built on plans approved by the government, but he gives drawings of a style of construction, with the vessels in sections, and the armor backed by coal bunkers, and quotes from the Chief of Naval Construction of the British Navy to show the effectiveness of coal and loose iron plates to resist the fire of heavy guns. These vessels, he claims, would be greatly superior to the best merchant ships heretofore built in their adaptability for war purposes, and quite equal to most of the modern iron-clads. The cost, also, is assumed to be less than would be that of simply taking care of an equal tonnage in time of peace, and not exceeding the annual appropriations of England and France to encourage mercantile shipping.

It is evident that this project should be looked at somewhat differently from the question of free trade *versus* protection, as they affect American ships. How far the plan suggested by Mr. Roach would be practicable only a board of naval experts can determine; but, were it feasible, it is apparent that the ends sought must be attained by having the ships built as well as owned in this country, and manned by American seamen. To this extent the appropriation therefor would be in the way of government protection and promotion of American ship manufacturing and shipping interests. On the other hand, one hundred such powerful steamships, capable of conversion into efficient iron-clads at short notice, would afford, in an emergency, a convenient naval force of considerable magnitude—a fleet by the side of which our entire navy at present would make but a poor show.

The first thing to be looked at, in any question of expending money to strengthen the navy, is the uncertainty as to what would be the best form of construction. Arms and armor have changed so radically within a few years, and the best authorities are still so widely divided in regard to most important particulars, that any large investment on this account is not to be thought of. Who knows, for instance, but that our recent splendid progress in the science of electricity may not lead to the development of such forces, heretofore unknown, as will make of little worth the best previous efforts in naval construction, and make the lightning as effectually our servant as steam and improved explosives now are? Looking at the matter in this light is the best justification of our past temporizing policy with regard to the navy, but under some such plan as that proposed by Mr. Roach the government would not have to expend much to largely supplement its naval strength, according to present standards, leaving out of view entirely the national benefit which such a fleet of American merchantmen engaged in foreign commerce would confer. It concededly costs ten to fifteen per cent more to build a first class iron ship here than it does in England; the capital to own and run the ship is also heavily taxed by our State laws, with no tax in England except upon net profits, and there are many petty charges here unknown abroad; but if it be possible to provide ourselves with a genuine "militia for the sea," a force on the water which would be a worthy counterpart of that which we always have on land, the plan would seem worthy of discussion on higher grounds than are usually considered in the questions which ordinarily make party issues.

THE COTTON MANUFACTURE.

The "cotton year," statistically, ends September 1, when the preceding year's growth is substantially all marketed, and the picking of the new crop is well under way, this part of the work extending up to the end of the year, and sometimes later. It is now certain that the crop of 1880-81 will exceed that of 1879-80, which was 5,761,252 bales, and was the largest crop ever raised in the country up to that time. The receipts reported up to August 10 were 5,735,356 bales, against 4,914,226 bales to the corresponding date last year. The quantity of cotton in a bale varies, although the improved machinery for compressing and baling has tended to make all bales heavier the last few years. The total weight of the last crop was 2,771,797,156 pounds, the lightest bales being of Sea Island, weighing 348 55 pounds, and the other descriptions varying from 460 to 509 pounds. Beside the American growth, India and Egypt together contribute about 1,500,000 bales annually to the world's supply of cotton, but of so different a quality as to affect but little the sale of the American staple with prices ruling as low as they have for a few years past.

Especial significance will be given to these figures this year, and to everything pertaining to the cultivation and manufacture of this great staple, by the exhibition to open at Atlanta in October, all the preparations for which are in a very forward state, and give promise of affording a worthy representation of the vast interests concerned. Many had wished that such an exhibition might have been held in some Northern city, near the principal centers of manufacture, but this would have reduced to a minor place what will be a leading feature of the coming show—the illustration of the conditions under which the crop is raised, and the practical working of the appliances by which it is made ready for market. The exhibition, coming as it does right in the harvesting period, and in a locality where the gathering of the crop can be personally investigated by all visitors, will present more vividly to the minds of mechanics, inventors, and business men many questions of importance which have hitherto received comparatively little notice. These include not only such as relate to the merits of different improved gins and various devices to facilitate the picking and bettering the average condition of the crop, but the larger problems connected with the possibilities of the future in the more extensive utilization of the seed and the stalk for the production of oil, feed, paper, a substitute for jute, etc.

We have had a large and healthy growth in the manufacture of cotton goods for a few years past, which has covered a substantial development in this branch of industry in the South itself, where the factories already in operation are making good dividends and many new ones are projected. But we do not as yet make up into finished goods more than about one-third of the cotton we grow. In this department of industry Great Britain has long been a great way in advance of all the rest of the world, taking about one-half of our raw cotton, and nearly all of that furnished by other cotton growing countries. For the past few years times have been "rather hard" with her in this specialty, as in many other manufactures, but the falling off in actual amount of production seems to have been due rather to a depressed state of trade generally than the competition of manufacturers elsewhere. For the four years between 1870 and 1875, her production exceeded $500,000,000 annually, the raw cotton costing from one-third to two-fifths of this amount, and the remainder going to pay for English labor and capital. About one-fifth of this great total was exported, while our own exports of cotton goods for those years averaged about $3,000 000 yearly; they have since reached $11,000,000; but our imports of cotton goods in 1880, notwithstanding a pretty stiff tariff, were but little below $30,000,000.

We come next to England in the manufacture of cotton goods, running more spindles than France and Germany together, but how far behind her we still are these figures too plainly indicate. Undoubtedly lower wages and cheaper capital give the British manufacturer his principal advantages, to which are to be added better means of communication with different markets, long established connections, etc.; but with all these in his favor he has been especially alert, within a few years past, in seeking out and originating improvements in the machinery required in the business. Marked advances in this direction have been made in the cotton industry quite recently, and there is hardly any detail of the business for which some new device or machine has not been brought forward. The value as to advancement in the product, or economical performance, of many of these supposed improvements are yet matters of debate in the trade here, but the exhibition at Atlanta, in which British manufacturers of cotton machinery are to be prominently represented, ought to be of great advantage to our manufacturers generally, on account of the comparisons they can then make of their practical working. If the exhibition can effect anything to improve our chances of successfully competing in many foreign markets now closed to us, so that we shall export more largely of finished instead of raw cotton, thus widening the field for the employment of American labor and capital, its influence upon industry, both here and in England, will be great.

IS CONSUMPTION CONTAGIOUS?

If our medical journals were to announce the steady approach to this country—say from China—of an ill-understood, painful, and usually fatal malady, which if once established among us would certainly kill half a million of our citizens every year and ultimately carry off one in every five of the entire population, it is safe to presume that the announcement would not be calmly received. As one man, physicians not less strenuously than laymen, we should demand the most rigorous quarantine against the infected country. No effort would be accounted too heroic, no precaution too costly, to shield our country from so disastrous an invasion. And if there were any doubt as to the specific nature of the threatened plague or of the mode of its transmission or inception, neither our medical and sanitary societies nor the government would rest until competent commissions were sent to investigate the matter. It would be accounted criminal indifference on the part of medical and sanitary authorities to neglect to make a concerted and persistent effort to discover the causes and conditions of the plague, and how to protect the community from its ravages or to cure its victims when attacked.

Would the urgency of the case be diminished in any

respect by the circumstance that the supposed invasion had already become a fact accomplished?

At first thought any one would reply: Not in the least; rather the contrary; for the evil in the latter case would be actual, not threatened merely, and the loss or saving of half a million lives a year is a matter of the gravest national importance. Yet it is a singular fact that while we should be thrown into a panic if half a million lives were threatened by a new disease, we accept as inevitable, almost with indifference, the certain killing of that number of people every year by an old and familiar malady. And our medical authorities tell us, without a twinge of professional pride, that they really do not know positively how consumption is induced and transmitted, or whether it is communicable from the sick to the well or not; and worse yet, they confess without blushing that they do not contemplate any special or general effort to have such momentous questions critically investigated!

When half a million of discontented natives of Europe throng to our shores in a single year we do not fail to appreciate the importance of the gain, both immediate and prospective. When a larger number of our own citizens are cut off untimely by a disease which, while it destroys them, transmits a legacy of sickness and too often early death to their descendants, we mourn our individual losses, but make no adequate effort to put an end to the national loss by urging or aiding the scientific determination of its conditions, causes, and remedies. Already one in every five of our population dies of consumption, and the indications are that the conditions of our civilization tend to increase the death rate from this cause. If the disease is infectious, as many believe, the multiplication of cases may sooner or later reach a point —if its progress is unchecked—at which a perpetuation of our race and the civilization developed by it will become impossible. Other races and civilizations have disappeared, leaving no explanation of the secret of their decline. Others, we have good reasons for believing, have been exterminated by plagues peculiar to them, developed in all probability by something peculiar to their modes of living.

That there is any imminent danger of so disastrous a result to our race and civilization from the increase of consumption no one but an alarmist would suppose; still it remains an impending possibility, more especially if there is any error in the common belief that the disease is not contagious or infectious.

In the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT a valuable summary of evidence supporting the position that the virus of consumption is specific and communicable is presented by Dr. Cogshall, of Michigan. The evidence is fuller and more cogent than is popularly believed; and while it must be admitted that many cases of supposed communication of the disease may be due not to any transmission of virus but to similarity of unsanitary surroundings and family customs on the part of related victims, there is still sufficient evidence that the direct communication of tuberculosis is followed by pulmonary consumption to justify not only exceeding care in the intercourse of the healthy with consumptive patients and rigorous sanitation in connection with all cases of the disease, but a special reinvestigation of the natural history of consumption by the medical profession.

The suggestions which Dr. Cogshall makes touching the measures best calculated to prevent the ravages of consumption, and his remarks with regard to the superior efficiency of hygienic treatment over medication, will be found worthy of thoughtful attention. The position he takes with regard to the curability of consumption, even in advanced cases, through improved nutrition and a judicious hygiene to the exclusion of all nostrums and so-called consumptive cures, is decidedly hopeful; and we believe that the most of our physicians will measurably agree with him. We wish we could be so well assured of their desire to investigate anew and thoroughly the question of the communicability of the virus of the disease.

OPENING OF THE PARIS ELECTRIC EXHIBITION.

The International Exhibition of Electricity at Paris was officially opened August 10. Much work remained to be done to put all the exhibits in proper position. The delinquents were mainly in the British and American sections. The French, German, and Belgian sections were more forward. The electric railway was not completed. The Tissandier balloon was ready and attracted much attention. President Grévy, the ministers, and a few other privileged persons were treated to a telephonic musical entertainment. Four wires had been placed in communication with the opera, and the voices of the opera chorus were heard with perfect distinctness.

SCHAEBERLE'S COMET.

The approaching comet (C 1881) discovered by Professor Schaeberle, July 13 (SCIENTIFIC AMERICAN, page 104), is more than fulfilling its early promises. Though dimmed by the light of the full moon it is already visible to the unaided eye and is rapidly increasing in apparent size and brilliancy. It is about fifteen times as bright as it was a month ago. Its bright nucleus, of an estimated diameter of from ten to twelve thousand miles, is surrounded by a hazy envelope or coma perhaps fifteen times as much in diameter. Its tail is said to surpass that of the great comet of 1858, the most conspicuous comet of the century, when that comet was as far from perihelion. The perihelion passage will be about August 20, and the comet will approach the earth most nearly a day or two after. About that time it will be at its brightest. Like comet B, now slowly going out of sight, the new comet remains above the horizon all night, but its motion is such that it will rapidly disappear after it passes the earth. The comet is to be looked for near the star Theta of the Great Bear, the tail pointing toward the north star.

A REMARKABLE INSTANCE OF RETENTION OF HEAT BY THE EARTH.

BY H. C. HOVEY.

Every one knows that heat may be retained for a long time in a bed of ashes, but it is seldon that the period has been known to be so protracted as in the case now to be described.

My attention, a year ago, was called by Mr. Hudson, the manager of the Albion Mines, in Pictou County, Nova Scotia, to a peculiar area including about two acres of ground, where the snow never lies long without melting, and the frost never penetrates far, even in severe winters. All over this space are scattered fused masses of clay and ironstone, resting on the outcrops of what are locally known as the "main" and the "deep" seams of bituminous coal, which at this point are about 450 feet apart. The outcrops of other seams are also partially affected.

On inquiring as to the probable date of the fire that had left this recrement of scoriæ and ashes, I was told that this portion of Nova Scotia was visited early in the seventeenth century by French explorers, and that an account of the harbor called Pictou was given in 1672 by the Governor of the Gulf of the St. Lawrence.

The name—Pictou—is derived from a Micmac word, signifying *fire;* and the traditions of the Indians still point to this locality as having been, a long time ago, the scene of a fierce and long-continued fire, which made them avoid the place as being visited with the anger of the gods.

The coal measures of Pictou were discovered in 1798, at the very point now described; and the discoverers represented the spot as covered with ashes over which grew large hemlock trees. Some twenty years ago, while a drain was being cut in this locality, a tree was felled that showed 230 rings of annual growth; and three feet below the root of this tree a large piece of wood was found that had been fashioned by some sort of ax.

In Mr. Harrison's opinion, at least 300 years must have passed since the fire at this point was extinguished. How it was caused and how long it burned are wholly matters of conjecture. The ignition may have been effected by chemical action, such as often causes what is called "spontaneous combustion" in heaps of slack about coal mines; or it may have followed a stroke of lightning; or the blaze of a campfire may have been communicated to one of the "springs" or "feeders" of inflammable gas that issue along the outcrops of the unusually thick seams for which the Pictou area is celebrated.

Last spring it was found necessary to sink a small pit at the outcrop of the deep seam on this area, in doing which a bed of hot ashes was reached. I am indebted to Mr. Edwin Gilpin, Government Inspector of Mines, for the facts, and, to some extent, for the terms in which those facts are presented. Mr. Gilpin prepared for me a comparative view of sections of the same strata made only a short distance apart, the design being to exhibit the changes made by igneous action.

Present Section.	ft.	in.	Original Section.	ft.	in.
Surface of burned clay	22	0	Black, argillaceous shale, with bands of ironstone 1 to 2 inches thick. Total thickness, 144 ft. 6 in.	2	6
Band of hard scoriæ	4	0	Brown carbonaceous shale,	1	10
Reddish ashes	3	0	Bad coal	0	2
Hardened shale	2	0	Good coal	3	7
Good coal etc. (being upper part of the deep seam)	+		Black shale with ironstone bands	1	2
			Good and coarse coal in alternate strata	18	1
Depth of pit	32	+	Total thickness of deep seam	22	10

The present section is taken at the new pit sunk by the Albion Mines Company on the burnt area; and what is termed the original section is one given by Sir William Logan ("Geological Survey of Canada," 1869, p. 69).

The surface cover consists of clay with bowlders of sandstone and layers of gravel. The small portion of the 144 feet of black argillaceous shale filled with ironstone balls passed through by the shaft has been converted into an almost continuous mass of scoriæ, very hard and compact, and difficult to drill through.

The next layer represents the upper portion of the deep seam, which has been completely burned away, leaving a *compact, laminated, reddish ash.* And it was in this ancient bank of ashes, *known to be more than* 300 *years old*, that the retention of heat was observed, which it is my object by this communication to place on record.

Immediately on opening the pit the heat of the ashes, at a point 30 feet below the surface, was tested by a reliable thermometer, and was found to be 80° Fah., at a time when the surface temperature varied from a minimum of 45° to a maximum of 65° Fah. Soon after an opening had been made through the pit to the workings in the mine the air currents caused the temperature to fall rapidly to the normal point.

The consideration of the gradual radiation of the heat of the earth suggests the idea that abnormal increases in the temperature of deep mines may be due in some cases to the presence, at comparatively short distances, of masses of heated matter, which are, geologically speaking, modern, although they may be historically ancient.

Technological Institutes in England.

The Prince of Wales has lately accepted the presidency of an institute of technology, called the City and Guilds of London Institute. It is located at South Kensington, and is intended to be the central institution of its kind for England and her provinces. The corner stone of the building was recently laid by the Prince, who in reply to the Lord Chancellor's address relating to the objects of the movement said: "Hitherto English teaching has chiefly relied on training the intellectual faculties so as to adapt men to apply their intelligence in any occupation of life to which they may be called; and this general discipline of the mind has, on the whole, been found sufficient until recent times. But during the last thirty years the competition of other nations in manufactures which once were exclusively carried on in this kingdom has become very severe. . . . Other nations which did not possess in such abundance as Great Britain, coal the source of power, and iron the essence of strength, compensated for the want of raw material by the technical education of their industrial classes; and this country has therefore seen manufactures spring up elsewhere, guided by the trained intelligence thus created. Both in America and in Europe technical colleges for teaching not the practice but the principle of science and art involved in particular industries, have been organized in all the leading centers of industry. England is now thoroughly aware of the necessity of supplementing her educational institutions by colleges of a like nature."

The Medical Congress and Sanitary Exhibition in London.

The Seventh International Medical Congress closed its sessions in London, August 9. In connection with the congress, which called together five or six hundred delegates, there was a sanitary exhibition to which nearly five hundred sanitary engineering firms and manufacturers of surgical instruments and apparatus contributed. This feature was particularly interesting and valuable. The different sections included: Surgical instruments and apparatus; appliances of the ward and sick room; electrical instruments and appliances; microscopes and optical apparatus; apparatus of other kinds used in the investigations of disease; appliances used in teaching medicine; domestic and hospital architecture; ventilation, lighting, and warming; sewerage and drainage; water supply and filtration; appliances used for the treatment of the sick and wounded during war; street ambulances, etc.; drugs, disinfectants, medical dietetic articles, and mineral waters; applications of hygienic principles to food and dietaries, clothing, etc.; school furniture; and miscellaneous articles for the promotion or maintenance of proper sanitary conditions.

Mining under Fire and Water.

In his annual report for the Eastern District of Luzerne and Carbon Counties, Pennsylvania, Mine Inspector W. S. Jones states that Butler Mine fire, which has been raging at Pittston for nearly five years, is now under control, and he anticipates no further serious consequences from it. The company surrounded the burning area with a wide ditch, varying from fifty to one hundred feet in depth, with a view to isolating the fire completely. A peculiar phase of mining is shown in the fact that while the fire raged in the upper vein the miners worked in the vein directly beneath, and at times the water dripping from above was scalding hot. This has been remedied by a costly system of ventilation. In view of the frequent fires in coal mines, Mr. Jones suggests that a strong continuous pillar of coal be left on the dividing line between collieries to prevent the spread of the flames from one mine to another. He points out a new source of danger in the fact that many collieries are now working under the beds of the Susquehanna and Lackawanna Rivers, and there is every reason to fear that sooner or later "caves" will occur, in which case the rivers would rush into the mines beneath with disastrous results, which would be multiplied by the indiscriminate system of working from one mine into another.

Recent Changes at the Patent Office.

Mr. Robert Mason, of Tennessee, promoted to be principal examiner; Marcellus Gardner, New York; John W. Babson, Maine, and Schuyler Duryee, New York, to be chief of divisions. Samuel B. Roane, New York; Reuben S. Parks, Ohio, and Louis W. Sinsabaugh, Ohio, from second assistant examiners to clerkships of class four. To be second assistant examiners—David Purman, Wisconsin; Marshall B. Cushman, Massachusetts; Edward M. Bentley, Connecticut; Albert C. Fowler, District of Columbia; and William Auginbaugh, Ohio. To be third assistant examiners—John W. Clements, District of Columbia; James B. Littlewood, Illinois; Rufus A. Morrison, Robert G. Read, and Walter F. Rogers, Pennsylvania.

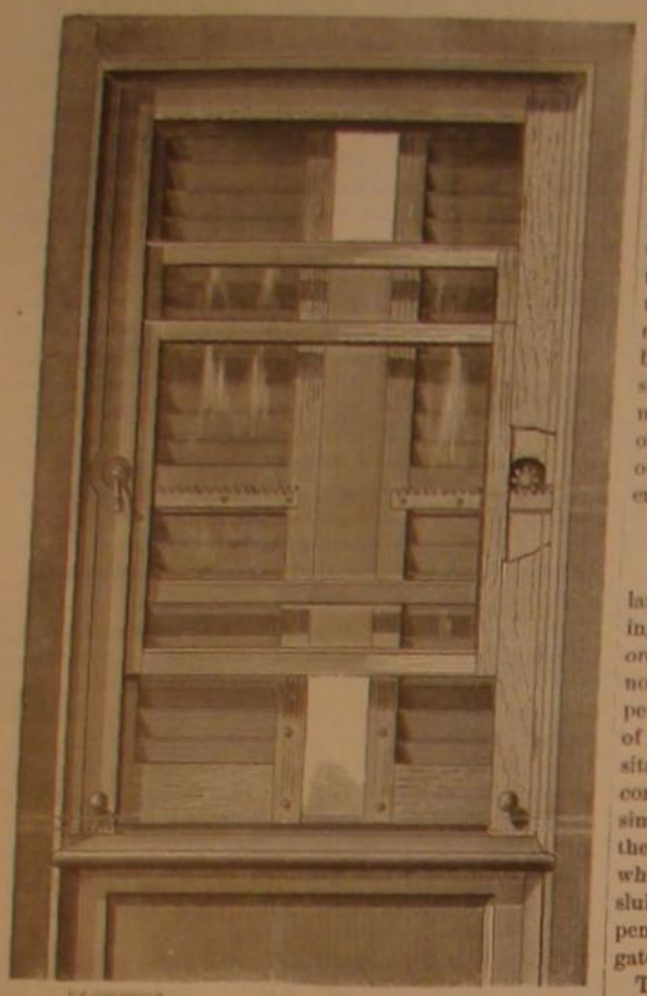
First Steel Works in Colorado.

The South Pueblo Steel Works just being completed at a cost of over $1,000,000, are the first establishment of the kind in the State. The company expect to be ready to turn out steel rails in December, and have contracted to furnish the Denver and Rio Grande Railway Company with thirty thousand steel rails for their extension. This will be about the capacity of the works for the first year.

The company own several mines near Placer and South Arkansas, to which side tracks will be extended by the railroad company.

IMPROVED SHUTTER-WORKER.

The engraving shows an improved device for opening or closing outside window blinds or shutters from the inside without the necessity of raising the window sash. The top and bottom of each shutter are provided with grooved rollers that run upon tracks at the top and bottom of the window casing, and these tracks are extended into recesses in the wall, into which the shutters slide.



WAGNER'S SHUTTER-WORKER.

Each shutter is provided with a rack which is attached to the middle rail, and upon each side of the window extending through the casing there is a spindle carrying a pinion, which meshes into the rack and is capable of moving the shutter as the spindle is turned. Each spindle is provided with a crank by which it may be rotated to open or close the shutters.

The top and bottom rails are provided with stops at their outer ends, and also with central or middle stops, to prevent the blinds from traveling too far in either direction.

The shutters may be placed upon tracks on the outer surface of the wall, and if desired the outside of the house may be provided with cases on both sides of the window, into the top and bottom of which the ends of the top and bottom rails are extended, so that the cases serve to inclose the blinds when open and protect them against the effects of sun or rain.

In order to lock the blinds firmly in place in any given position—either open, partially open, or closed—and to prevent rattling, there is a bolt on each side of the window, the screw-threaded inner end of which works in a threaded box sunk into the jamb or casing, while the outer end projects out through the wall in a line with and opposite to or facing the blind bottom rails. Each bolt has an ornamental knob or handle at its inner end for operating it. These knobs also serve the purposes of holders or hangers for the curtain-bands when the curtains are drawn aside. If desired, the bottom rails of the blinds may be provided with two or more recesses in a line with the projecting outer ends of the bolts, into which the points or ends of the bolts are inserted when the handles are turned, and which will prevent the shutters from being moved to either side. Under ordinary circumstances, however, this will not be found necessary, as the bolts will bind the blinds with sufficient firmness simply by bearing against the blind rails.

This invention was recently patented by Mr. Theodore Wagner, of 2101 Hyde street, San Francisco, Cal.

Automatic Counting of Letters.

Two officials of the London Post Office have invented and patented a method of automatically registering the number of letters stamped. The counting may be done by mechanical or by electrical means. In the first case a small counter, similar to an engine counter, is placed in the head or handle of the hand stamp, and each time the stamper presses it upon a letter it is registered on the counter. At the close of the day the stamp is opened, the number of letters stamped read off and registered, and the counter set ready for the next day's work. In the second case, two methods have been devised for electrically effecting the object. In one the striking of the inking pad causes electrical contact to be made, which transmits a current to a counter similar to that of a gas meter, and so registers every letter stamped. The other method is similar in principle, but a lever stamp is employed.

IMPROVED FILTER.

This filter is designed to supply the demand for cleansing large volumes of water where the supply is drawn from flowing streams that are subject to rolling to such an extent that ordinary filters are useless, and where hydrant pressure cannot be had. Also where the amount of sediment and suspended matter is so great as to render other filters a source of constant annoyance by becoming clogged, thereby necessitating the frequent removal of the filtering material. The construction of Land's upward water filters is such that by simply raising a gate the backward action of the water frees the bed of filtering material, so that it is as good as new, while at the same instant a flushing reservoir is let go that sluices along the bottom and carries out all sediment or suspended matter into a waste sluice or drain. By closing the gate the filter at once acts as well as when first used.

The filtering material need not be renewed if proper attention is paid to flushing, and this is a matter of only a few minutes' work.

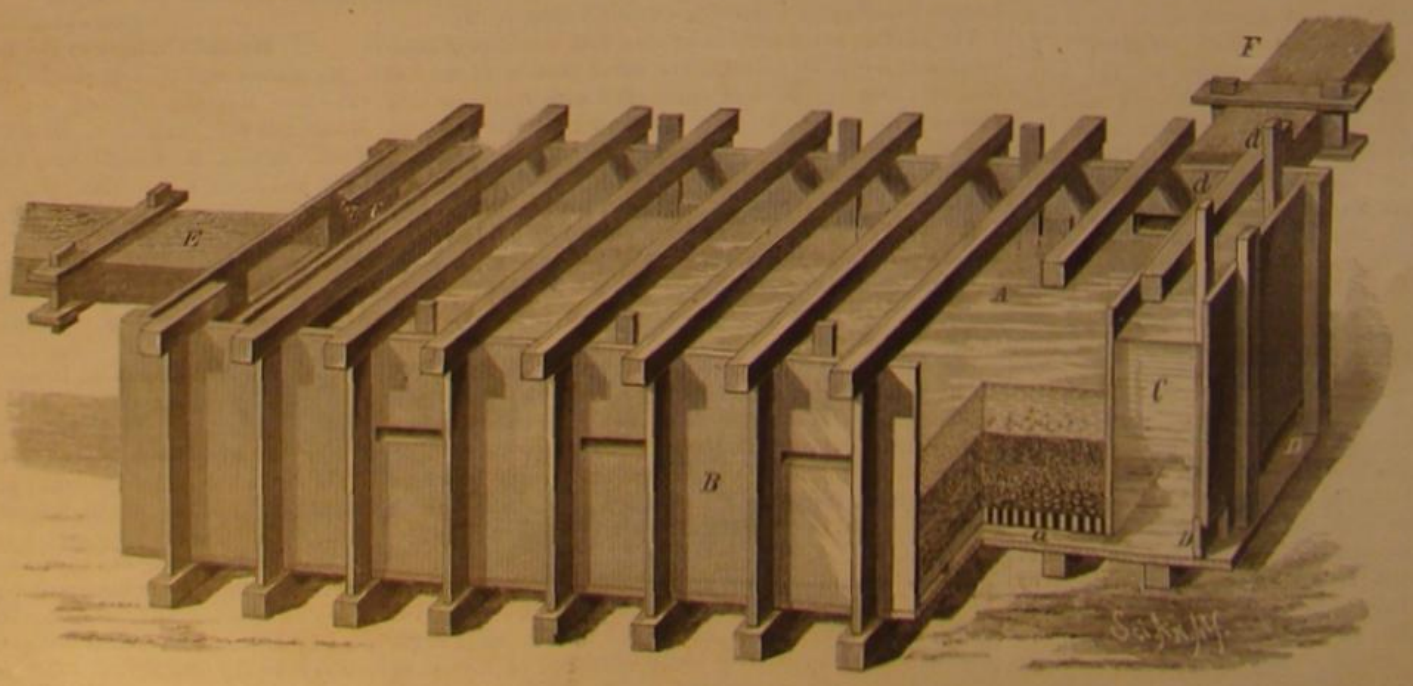
The bottom of the filter box, A, rests upon the slats or scantling, *a*, which are of suitable size and strength to support the filtering material, and are placed upon their edges, a small distance apart. The filter box is of such size relative to the outside box, B, as to form the reservoir or pen stock, C, at the sides of the filter box. The reservoir, C, has the outside openings, D D, at the bottom, which are closed by the sliding gates, operated by the rods or bars, *d d*.

The water to be filtered passes from the race, E, into the reservoir or penstock, C. In this reservoir or penstock a water head is maintained which forces the water into the sluiceways formed by the strips or scantling and upward through the filtering material. The filtered water flows out through the sluice, F.

When it is desired to clean the filtering material and the bottom of the filter of the sediment which will collect in them, the gates, D, are to be opened, and the current caused by the flow of water through the gates will carry away and thoroughly remove the sediment.

These filters can be made to deliver any amount of clean water from 100,000 to 100,000,000 gallons in twenty-four hours. They are now in use by the Colorado Coal and Iron Company and by the Grant Smelting Company, also the Pueblo Smelting and Refining Company, all of Colorado. The first named company use two millions of gallons daily.

For particulars apply to A. W Geist or Gordon Land, patentees, Pueblo, Col.

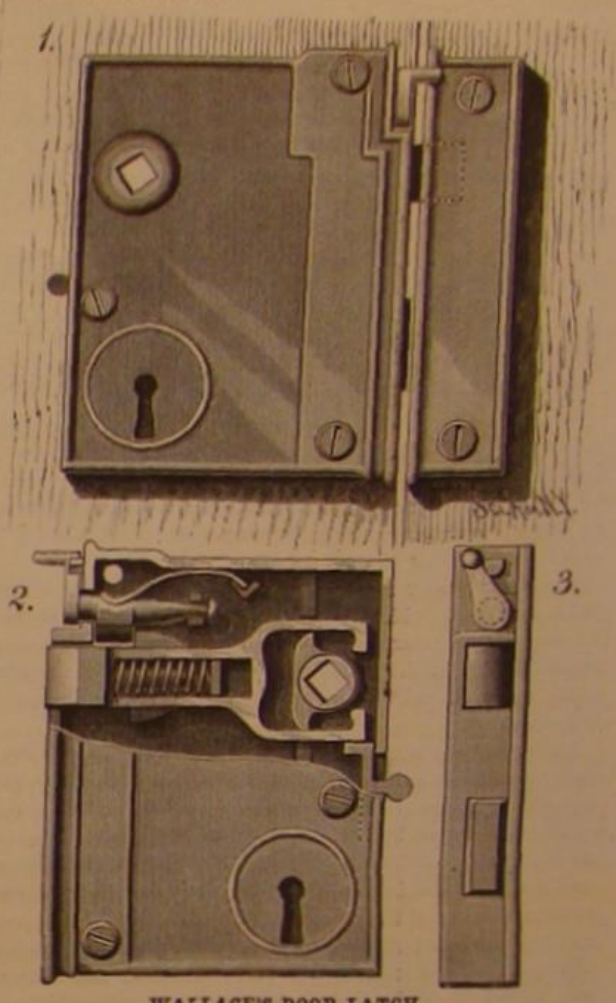


LAND'S UPWARD WATER FILTER.

IMPROVED DOOR LATCH.

The latch improvement shown in the annexed engraving is designed to obviate the difficulties sometimes experienced in closing a door when there is considerable friction between the latch and the catch plate. In the latch shown in the engraving the catch when retracted is retained in that position by means of a detent seen above the latch bar in Fig. 2. This detent is formed on a short rocking spindle, which extends through the lock casing, and is provided at its outer end with a crank arm capable of engaging the face of the catch plate.

The detent is held into engagement with the latch by means of a flat curved spring, and when the latch is retracted by turning the door knob in the act of opening the door the latch is held in that position by the detent until the crank arm strikes the face of the latch plate, when the latch is released and slips behind the face of the plate without friction and without wear.



WALLACE'S DOOR LATCH.

Fig. 1 in the engraving shows the lock in side elevation. In Fig. 2 a portion of the casing is broken away to show internal parts, and Fig. 3 is an end view.

This device removes all necessity for slamming doors and increases the durability of the latch manyfold.

Further information in regard to this useful invention may be obtained by addressing the patentee, Mr. Lorenzo Wallace, of Leavenworth, Kan.

MECHANICAL INVENTIONS.

An improved ice-delivering machine has been patented by Mr. Jeremiah M. Jones, of Lucas, Ohio. It consists in constructing an ice-delivering machine with an endless carrier to receive blocks of ice from an ice house and lower them to a chute, down which they slide to a receiver, sashes that carry the carrier and slide in ways in the main frame, the sashes being adjusted and held in place by a jack screw and set screws connected with the main frame, a tapered friction wheel, friction clamps, and a clamp lever for controlling the descent of the ice, and a bar and suspended weights for balancing the descending blocks of ice, whereby the ice will be delivered by its own weight, and the rapidity of descent of the ice blocks can be easily controlled.

An improved circular sawing machine has been patented by Mr. Chas. S. Beath, of Escanaba, Mich. This invention consists of a circular saw mounted on a swinging gate, of a frame provided with a roller table for the log or poles to be cut, and with an adjustable gauge. The swinging gate is provided with

pulleys for maintaining a uniform tension of the driving belt, and is drawn inward by spiral springs, but is drawn outward, when the saw is to cut, by means of a rope or chain attached to the swinging gate and to a lever pivoted to the end of the frame and acted upon by a pivoted bent lever.

An improved machine for stirring and discharging mash has been patented by Mr. Stillman E. Chubbuck, of Boston, Mass. This invention relates to that class of machines for stirring and discharging mash in which vertically and horizontally revolving agitators and scrapers are used, and the improvement consists in certain peculiarities of construction and arrangement which cannot be clearly described without engravings.

An improved windmill has been patented by Mr. Homer B. Sprague, of Grantville, Mass. The object of this invention is to furnish self-regulating windmills so constructed that the sails or vanes will adjust themselves to the varying force of the wind, so that the driving wheel will rotate at a nearly uniform velocity and with more or less power up to the limit permitted by the wind, and according to the gravity of the weight or force of the pulling power applied to the cord that draws the sails or vanes into position to catch the wind.

An improved device for operating the doors of elevator wells has been patented by Mr. John P. Wykoff, of Rochester, N. Y. The invention consists in projecting plates or tracks which are attached to the inner side of the doors, and are inclined from the ends of the outer edges toward the middle of the inner edges of the door, against which plates or tracks a roller mounted on a stud on the car presses, thus opening or closing the door accordingly as it presses against the upper or lower surface of the inclined tracks, the ends of which are hinged to swing inward toward the middle of the door to let the projecting roller pass after having opened or closed the door.

TEMPORARY STEERING APPARATUS OF H.M.S. BACCHANTE.

While the Prince and Princess of Wales, with their younger children, have enjoyed an hour's pleasure trip on Virginia Water, Prince Albert Victor and Prince George of Wales, serving their Queen and country on board H.M.S. Bacchante, have had to look out for squalls. We are favored by a correspondent from that ship with the accompanying sketch. The Bacchante was caught in a heavy squall in the South Indian Ocean, two hundred miles west of St. Paul's Island, nearly half way between the Cape of Good Hope and West Australia. She had her sails split, several sheets carried away, the fore topgallant mast sprung, and the topmast studsail carried clean out of the bolt ropes, as the wind shifted suddenly to the starboard beam. Again, when the Bacchante approached Cape Leeuwin, the southwest point of Australia, while running before the wind, three hundred miles south of that point, she met with another disaster. The wind suddenly shifted about two points, and the ship "broached to," and was struck by a heavy sea. One life boat was carried away from her quarter, while the other life-boat was forced in-board, breaking the davits, and striking the rudder head. It gave such a violent wrench to this, that the rudder was disabled, and it became necessary to rig up a temporary steering apparatus, which is shown in our illustration. It consisted of two spars lashed together, and towed directly under the stern, to the aft ends of which two hawsers were affixed, one leading on each side of the ship, through a block on the end of the spars. The Bacchante was enabled, by these means, safely to be steered into the port of Albany, West Australia, where she was laid up for brief repairs. The two young princes went on to Adelaide and Melbourne.—*London Illustrated News.*

IMPROVED SPRING BED.

The spring bed shown in the engraving is formed of a series of horizontal slats, A, resting on crossed inclined

Fig 1

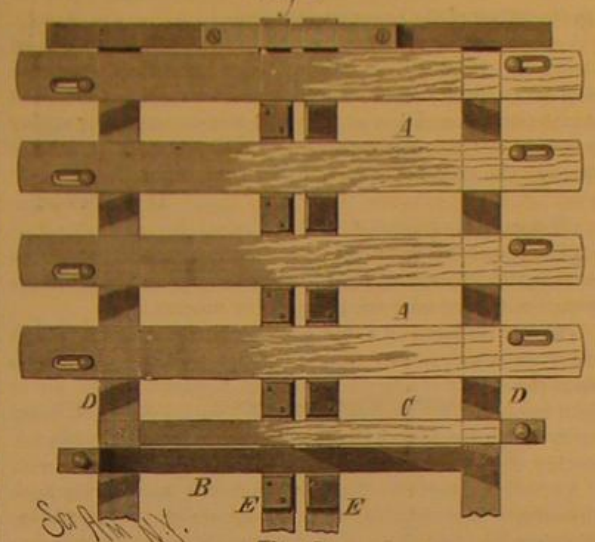
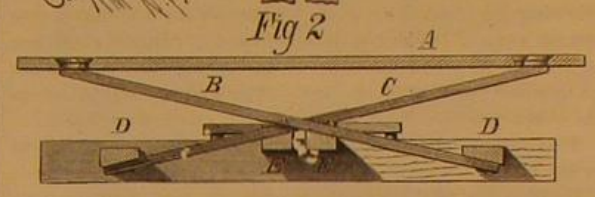


Fig 2



HEBERT'S SPRING BED.

spring slats, B C, the latter having their lower ends fastened to the longitudinal side bars, D, of the base frame. The middle of the spring bars rest upon the adjustable longitudinal bars, E.

The slats, A, have short longitudinal slots in the ends for receiving screws which pass into the ends of the crossed slats, B C. The longitudinal rails, E, are made movable to adjust the tension of the spring slats, B C. When the rails are moved outward the elasticity of the springs is diminished; when they are moved toward each other the elasticity of the springs is increased.

Fig. 1 is a partial plan view of the improved spring bed, and Fig. 2 is a vertical transverse section.

This improvement was lately patented by Mr. Hubert Hebert, of Lake Linden, Mich.

A Rocket Torpedo.

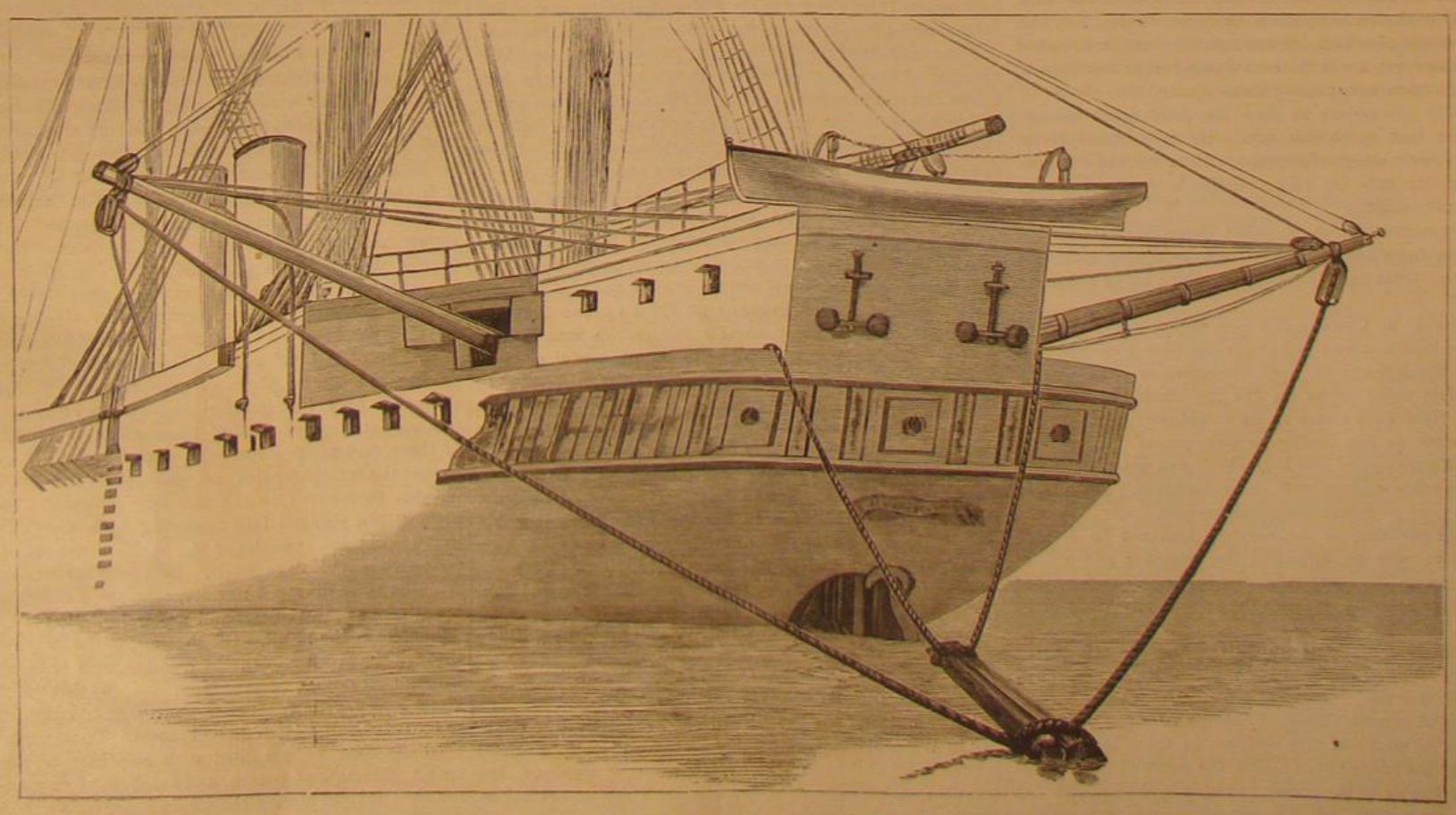
The Providence (Rhode Island) *Evening Bulletin* says: Some exceedingly interesting experiments lately took place at the Torpedo Station with the Weeks rocket torpedo. This torpedo is a most peculiar structure. It consists of a float made of tin and sheet iron, being braced internally with wood. It has two rudders similar to the tails of a sky rocket. The float portion is some eleven feet long, with the rudders of the same length. In the forward part or head is placed some fifty pounds of dynamite, and this, coming in contact with the object, explodes by concussion. The whole structure is propelled by a rocket, some six inches in diameter, three and a half feet in length, and weighing 100 pounds. It moves on the surface of the water, and has attained the wonderful speed of about 150 feet a second, which is kept up for four or six hundred yards. It is aimed at an object, and moves in a straight line guided by the rudders. It is placed in the water from a wharf, a raft, or a ship. It is operated either by electricity or a percussion. The rocket portion is protected from the wet by a tin stopper, through which the wicks for igniting pass.

The principal object in testing the torpedo here is to discover how it will behave in rough weather. The board consists of Lieutenant-Commander R. B. Bradford, Lieutenant-Commander Benjamin L. Edes, Lieutenant J. F. Meigs, and Master A. L. Case. The inventor was busily engaged yesterday morning preparing for the experiment. The board was called together for half past 1 o'clock, but it was nearly an hour later when the experiment was made. Captain T. O. Selfridge, the Commandant; Captain Johnson and Lieutenant-Commander Chadwick witnessed the trial; Lieutenant Meigs was in a small boat to time, Lieutenant-Commander Bradford looking out for the distance. Suddenly a whizzing noise was heard, and the extraordinary torpedo went on its way. The velocity was something frightful, as may be judged when it is stated that the torpedo passed along and over (for it jumped occasionally) a distance of water not less than 1,375 feet in about *nine seconds*. One gentleman present thought it was not more than eight. It was impossible to time it correctly, for the smoke behind was very dense. Captain Selfridge said that this trial was a success. The torpedo kept on an almost perfectly straight course, notwithstanding the fact that there was considerable wind which bore on the port side. The roar of the rocket as it drove the torpedo along was something dreadful, quite sufficient, had it been sent off at night, to "drive people crazy," as some one remarked. The torpedo was directed in a course toward the extreme west point of Coaster's Harbor Island. The visiting officers present were very much pleased with the successful exhibition.

Fired by Electricity.

An interesting illustration of the danger attending the manufacture of some kinds of rubber goods was shown in the origin of the recent fire which occurred in the Ætna Rubber Mills, at Jamaica Plains, Mass. The cement which fastens the seams of rubber coats is largely made of naphtha. The mere act of lifting a piece of rubber cloth from a pile of half a dozen similar ones, cut for garments, developed so much electricity that a spark was observed to escape. It came in contact with the naphtha cement, or with gases arising from it, and instantly the whole room was in a blaze. Fortunately the fire was extinguished without destroying the mill, the loss being only about a thousand dollars.

It is not known that anything can be done to prevent the occurrence of another accident of precisely the same kind, whenever all the atmospheric conditions are favorable. One would suppose, however, that a certain degree of dampness would remove all danger from that source.—*Commercial Bulletin.*



TEMPORARY STEERING APPARATUS OF H.M.S. BACCHANTE.

Correspondence.

Bell's "Undulatory" Current.

To the Editor of the Scientific American:

In your issue of July 16, 1881, I see that a very important and sweeping decision has been made by a learned judge of Boston in regard to the right of Alex. Graham Bell to transmit articulate speech by electricity.

Mr. Bell says that "in this specification (174,465) the three words, oscillation, vibration, and undulation, are used synonymously, and in contradistinction to the terms intermittent and pulsatory." We wish to ask, Is not the impulse from a Blake transmitter a pulsatory current and not an undulatory current? Who ever heard of a wave in a pile of cord-wood or a mass of pig iron? If Judge Lowell sustains Mr. Bell in his right to transmit vocal sounds by electricity, what are we to do with Gray and his singing telephone that was made before Bell came upon the stage? Is not singing a vocal sound? Mr. Bell or his company have not said one word about the Blake or the Edison transmitter which transmit all of the messages in our exchanges.

Why have they not prevented Mr. Edison from putting up his telephone, if the opinion of Judge Lowell is correct?

The impact is made by the transmitter and carried along the wire to the chalk cylinder, and there by the force applied to the crank of the electromotograph the receiver talks in loud tones, as is impossible for the Bell receiver in this case. The method of producing electric impact is the same as is to-day used by all telephones and not by a "Bell phone."

From the fact that the vibrations of the human voice can be photographed (see SCIENTIFIC AMERICAN for June 18, 1881) with distinctness, and also from the fact that the phonograph shows positive indentations upon its surface, and that those irregularities will, when brought in contact with the point fastened to the diaphragm, reproduce articulate speech, shows conclusively to us that the transmission of speech by electricity is not the result of electric undulations, but of positive "impact," pulsation, and that every time the hammer in a Blake transmitter strikes the carbon button with, say, one unit of force we get a displacement of the diaphragm equal to that unit of electric power transmitted, and it follows because a certain number of carbon particles come in contact with the hammer; but you double the sound and you double the force, and in doubling the force you double the number of carbon atoms in contact with the metal, hence the increase of sound by the increase of quantity of electric impact. Who can look the facts squarely in the face and say that a wave of electric fluid ever passed through a solid mass of iron? It looks to us almost as speculative as Jules Verne's trip to the moon.

ORSON MILLARD.

Flint, Michigan.

Bullion Safes.

To the Editor of the Scientific American:

Noticing the communication of Walter L. Smith, in your issue of 13th, in regard to safety of contents of express or bullion safes, and as the quantity of money and bullion in transit is so largely increasing, the idea is of increasing importance.

In the West a combination lock is largely used that admits of its combinations being instantly cut off, and, when required, instantly replaced, and at the same time thoroughly reliable and simple in operation.

In use on express safes it works admirably. For instance, starting the bullion safe from San Francisco, the local express agent moves a slide on the lock to No. 1. This puts on one combination. When safe is closed and locked the agent does not know the combination that will unlock, nor does the route agent.

When this safe arrives at Reno the local agent has one combination that opens that safe. He opens, receipts for contents to route agent, adds what bullion he has on hand, and locks the safe on two combinations, the last one unknown to himself.

The next local agent at St. Louis opens that safe on the two combinations known to him, and by simply moving a slide puts on three combinations, the third being unknown to himself.

Upon arrival at Chicago the local agent opens the safe upon three combinations and closes on four combinations. Cleveland agent opens on four combinations and closes on five. Buffalo agent opens on five combinations, closes on six. And New York opens on six combinations.

This course, as can readily be seen, places the responsibility at all times upon one individual, and upon the superintendent's office, and protects the route agent. These locks have been used with eighteen combinations.

They are peculiar, as the combinations *can* be divided between two persons, requiring the presence and aid of both persons to open any safe—for instance, the local and route agents operating to open the safe at any given place or station.

For ordinary or daily use, upon opening the safe in the morning the slide is changed from 6 to 1, leaving one combination for day use.

The general superintendent of express safes can order any route agent to make certain changes in these locks which will change the entire combination, the result of this change only being known to the person ordering it to be made. At any subsequent time the superintendent can pick up the combination so changed by using the model upon his desk, and then for the first time any one know upon what combination that safe locks and unlocks; information can then be telegraphed to proper persons.

The use of the time lock is also possible for guarding bullion safes, as the invention and introduction of the non-lock-out time locks render use of time locks possible, as no accident will cause a lock-out of these reliable and desirable devices.

S. M. BARRETT.

Cincinnati, O.

Transmitting Speech by the Telegraph Key and Sounder.

To the Editor of the Scientific American:

I see in your last SCIENTIFIC AMERICAN, in an article by George M. Hopkins, engravings of a method of transmitting articulate speech by an ordinary key and sounder, but it gives no information as to how it is done except by saying it is only a matter of adjustment. Will you please tell me through the columns of your paper how this is done?

H. F. DODGE.

Clinton, Mo., August 3, 1881.

[The sounder is mounted on a thin board, and the sounder lever is rigidly secured by the adjusting screws so that the armature is very near the poles of the magnet.

The key is placed on a thin board or on a resonant box, and the screw which passes through the key lever and bears upon the spring is loosened until the platinum points are in light contact. By placing the ear in contact with the board upon which the sounder is mounted, and listening while adjusting the key, the proper contact may be readily secured.

Another method of adjusting the key is to turn the back adjusting screw until the contact points of the key touch, allowing the upward pressure of the spring on the key to remain normal. The required delicacy of contact may then be secured by screwing down on the spring so as to increase its upward pressure on the key. The key is mounted as in the other case.

This experiment requires a current whose strength is eight or ten volts.

By listening to the sounder whatever is said in the vicinity of the key may be heard.]

The French Population in New York.

Some time since a committee was appointed by representatives of the twenty-three French societies in this city to found an infant school on the French plan for the small children of that nationality in this city. The first work of the committee was to investigate the numbers, needs, tastes, and habits of our French population, and to select the location most eligible for the institution contemplated. A member of the committee, Mr. Gustave May, reports that the French speaking population of New York city, including natives of France, Belgium, Switzerland, Alsace, and Lorraine, number between twenty and twenty-five thousand. The most of them speak English imperfectly or not at all, and are chiefly concentrated within a comparatively small district, extending from Canal street on the south to Washington Square on the north, and bounded on the west by Sixth avenue and Varick street and on the east by Broadway. French families of the higher class are domiciled in other and more eligible quarters of the metropolis, but the poor Frenchman, with a pittance of income or capital just enough to start in furnished apartments, inevitably gravitates toward a region of which South Fifth avenue is the main thoroughfare.

"It is a curious fact," observed Mr. May, "that among immigrants from France to the United States the women find remunerative employment far more readily than the men, and the support of the family often devolves for a considerable period upon the wives and daughters, while the husbands and brothers live in enforced idleness or eke out scanty incomes by odd jobs and irregular services." The cause of this social anomaly, which makes the woman the bread-winner of the family, it has been critically observed, is due to the fact that she is generally an expert in some one of the industries that command steady employment and good wages. She is a good laundress, an adept in the manufacture of artificial flowers, a first-class *bonne*, a neat seamstress or milliner, or an excellent servant in some one of the special capacities that secure entrance to Fifth avenue families. Very few days elapse generally before the women find remunerative work in some department of useful or ornamental industry, but the men often linger in discouraging idleness for months before positions can be secured. Good gardeners find business very readily at high wages. The range of employments is very limited, however, for the male immigrant, and he frequently has to depend for a considerable period upon the deft and business fingers of his wife, sister, or daughter. And in too many instances, it would appear, the French immigrant straightway forgets that he is not in Paris, and, instead of earnestly studying English and looking for employment, he spends his time with his confreres planning social and political reforms and discussing vinous projects for ameliorating the condition of working men.

A Salle d'Asyle for New York.

A committee of our French citizens have decided to establish in Washington Square a day asylum and training school for the small children of the French working people of that neighborhood. Schools of this character are as peculiar to France as the kindergarten is to Germany.

First, there is a schoolroom provided with desks, seats, etc., even with cradles, swings, and baby carriages for the benefit of the younger pupils. Children from two to six years of age are admitted. Each is received at the vestibule by a servant or nurse, taken to the bathroom, cleansed, and attired in a neat uniform for the day. The clothing that the child wore on entering is then brushed and put away to be resumed when its parents or guardians call for it late in the afternoon. The hours are made to correspond to the working hours of the population in the midst of which the school is located—from 7 o'clock in the morning until 6 or 7 in the evening. Having been bathed, uniformed, etc., the pupil is taken to the schoolroom, where the tuition consists of some simple object lessons, calisthenics, repetition in concert, and so on. The division into classes is left to natural bias and capacity, and the selection of studies to be pursued is governed by the natural inclinations of the child as ascertained by the observation and patient vigilance of sympathetic instructors and nurses. A large yard suitable for a play ground for the children is essential, and shade trees form a necessary feature. One section of it is neatly turfed and thus transformed into an ornamental green; others are left open for the cultivation of flowers or plants, or for any horticultural fancy that may strike the active and awakened imagination of the pupil. The exercises in the schoolroom are brief, not occupying more than a few minutes at a time; but even in play the manners, habits, and physiological aptitudes of the child are carefully studied and trained to grace and beauty.

At noon a simple dinner is neatly served by the attendants. It consists, not of dainties, but of some nutritious soup, bread and milk, and other articles fitted to diet of children. If the parents are able to pay for this simple meal a fixed charge of two or three cents is generally exacted; but this is an open question and one not permitted to stand in the way of the pupil's admission or training. There are now, it is stated, no fewer than 17,000 of these *salles d'asyle* in France, and the number is being yearly augmented.

Improved Photo Emulsion.

The following is the specification of M. Stoerk's patent, March 27 and May 20, 1880:

"My invention consists in introducing into a solution of gelatino-bromide of silver in water an antiseptic more volatile than the water, which mixes with it in all proportions without precipitating the gelatine, which has no injurious action on the gelatine or on the silver bromide. For this purpose I give the preference to acetone, methylic alcohol (pure 1,000 spirit), or alcohol, either separately or combined. I introduce this substance in the proportion of 50 per cent.

"*Manipulation.*—In 1,000 parts of pure water I dissolve 30 parts by weight of ammonium bromide. To this solution I add gradually a solution of 45 parts by weight of silver nitrate in 500 parts of distilled water. The silver bromide thus obtained is washed during a space of six hours half a dozen times to remove the nitrate of ammonia, as well as any excess of ammonium bromide, so that there remains after this washing nothing but silver bromide containing water.

"I next add enough pure water to make up 500 or 640 parts containing 5 parts of ammonia, and 24 to 30 parts of neutral gelatine (Nelson's No. 1), and I raise the whole in a water bath to a temperature of 35° C., and keep it at that heat for six hours. Then I add to the emulsion thus formed from 50 to 100 per cent of its own volume of acetone, and thus obtain a non-putrescent and rapidly desiccating emulsion, which is always fit for use.

Colored Photographs.

A recent communication to the French Academy of Sciences announces a new method of taking photographs in color, which, although it is not a solution of the prime problem for photographers, how to photograph nature in her own hues, is at least some mechanical approach to it. It is the invention of MM. Ch. Cros and J. Carpentier, and consists in taking three separate photographs of the red, yellow, and blue tints, then combining them. Three negatives of the object are first taken, one through a screen of orange liquid, one through a screen of green liquid, and one through a screen of violet liquid. The varying opacities and transparencies of these negatives indicate the relative quantities of red, yellow, and blue tints in the object. The proofs are taken on plates of glass coated with coagulated albumen which has imbibed bichromate of ammonia. A transparent negative, or first photograph, is applied to one of these, and exposed for some minutes to a diffused light, so that the transparencies and opacities of the negative shall imprint themselves on the sensitive albumen. The proof plate is then plunged into a coloring bath, and in the parts protected by the opacities of the negative, the coloring matter spreads and fixes itself. By repeating this operation with the three different negatives the three colors are combined on one glass plate, and a fair imitation of the original object is the result. Of course, for the image obtained through the green screen the coloring bath is red; for that through the orange screen, blue; and for that through the violet screen, yellow. The same screens and pigments serve to reproduce all sorts of polychromes. The screens hitherto used are glass vessels filled with solutions of chloride of cobalt, chromate of potash, and sulphate of copper. When the electric light is used the screen is put before the lamp, so that the object will be illuminated by a monochromatic light and photographed in the ordinary way.

NEW INVENTIONS.

An improved attachment for gas burners, patented by Mr. George E. Smith, of New York city, is designed to prevent gaslights from being accidentally extinguished. It consists of a conical topped box, having a central diaphragm, apertures being made very near the middle of the box, and the diaphragm to permit the box to be mounted upon a gas burner. In use the cone of the box stands just below the tip of the gas burner. At the base of the gas burner a small aperture is made, through which gas constantly escapes when the gas is turned on for use. When the gas is lighted at the burner in the usual manner the escaping gas at the pin hole also ignites and continues to burn. Should the gas at the burner become extinguished by accident or from being blown out, the flame from the pin hole will immediately ignite the escaping gas from the burner. The conical shape of the box and the central diaphragm serve to protect the pin hole jet from becoming extinguished except when the gas is wholly turned off by the usual gas cock.

Heretofore vehicles have been constructed either with ordinary wheels only or with flanged or car wheels only, and with this construction it is very difficult for a vehicle with ordinary wheels to run on or from a track, and likewise it is very difficult to run a vehicle with flanged or car wheels from a track, in case an impediment or obstruction on the track is to be avoided, without damaging the wheels or the entire vehicle. Mr. José de Cauterac, of Madrid, Spain, has patented a vehicle which is equally well adapted to run on an ordinary road or on rails.

An improved game board for playing with marbles has been patented by Albert Benson, of Melrose, Mass. The invention consists in a circular board slightly inclined toward the middle and provided in its upper surface with a series of concentric circular grooves. A series of grooved radial arms, with baskets or boxes at the outer ends, are provided at the inner ends with tenons fitting in mortises in the edge of the circular board, which is provided with a sliding tally strip adjoining each radial arm.

An improved atomizer has been patented by Mr. George Schlauch, of Lancaster, Pa. The invention consists in the combination, with the vessel and its discharge tubes, of the double-acting air pump provided with valves and air conductors, whereby a continuous discharge of air will take place through the air discharge tube when the pump is worked, and a continuous delivery of spray will be maintained.

Mr. William Riley, of Dannemora, N. Y., has patented an improvement in the manufacture of felted hats and machine therefor. The invention consists in combining jet pipes and a hot water supply pipe with a hat block, and in combining cold and hot water supply pipes having rose jets with the hat block and stretcher.

An improved vapor burner has been patented by Mr. William H. Russell, of Sedalia, Mo. This invention is an improvement in that class of gasoline or hydrocarbon burners in which a jet of the heated and volatilized liquid issues through an orifice opening between an upper and lower plate, which spread the flame, and in which a screw valve regulates the admission of oil to the burner.

Mr. Edmund T. Lukens, of Oxford, N. J., has patented an improvement in that class of devices which are designed for the purpose of opening, closing, and locking blinds and shutters from the inside of the house. It consists of a sliding and rotating shaft passed through the window casing, and carrying on its outer end two beveled pinions, the extreme one of which is fixed to the rotating shaft, while the other pinion is rotated by the shaft which slides longitudinally through the pinion, the pinions gearing at one and the same time with a horizontal gear wheel that forms part of the shutter or blind hinge to hold said shutter or blind locked in any desired position, the extreme pinion being disengaged from the horizontal wheel when the said shutter or blind is to be opened or closed by the action of the inner and sliding pinion.

The Census of Great Britain.

On the night of April 4 the population of the United Kingdom of Great Britain and Ireland, including the islands in British waters (the Isle of Man and the Channel Islands), together with the army and navy and merchant seamen abroad, was found to be 35,246,562, an increase of 4,147,236 as compared with the returns of the census of 1871. The females exceed the males by a little over 700,000. The percentage of population for England was 69·8; for Wales, 3·8; for Scotland, 10·6; for Ireland 14·6. The remainder, 1·2 per cent, was distributed between the Isle of Man (0·2), the Channel Islands (0·3), and the army, navy, and seamen abroad (0·7).

The density of population in England and Wales is 440 to the square mile. The greatest density is in the mining and manufacturing counties. Lancashire has over 1,700 to the square mile, and Middlesex (outside of London), 1,364. Six counties in England and one in Wales have over 500 to the square mile. London has 486 286 houses and a population of 3,814,571, having increased over half a million in the past ten years. The density of population in London is now 32,326 to the square mile.

Liverpool ranks next London in England, with a population over 550,000; Birmingham has over 400,000; Manchester and Leeds each exceed 300,000; Sheffield and Bristol have over 200,000 inhabitants each. Curiously the population of Manchester has fallen off 10,000 since the census of 1871.

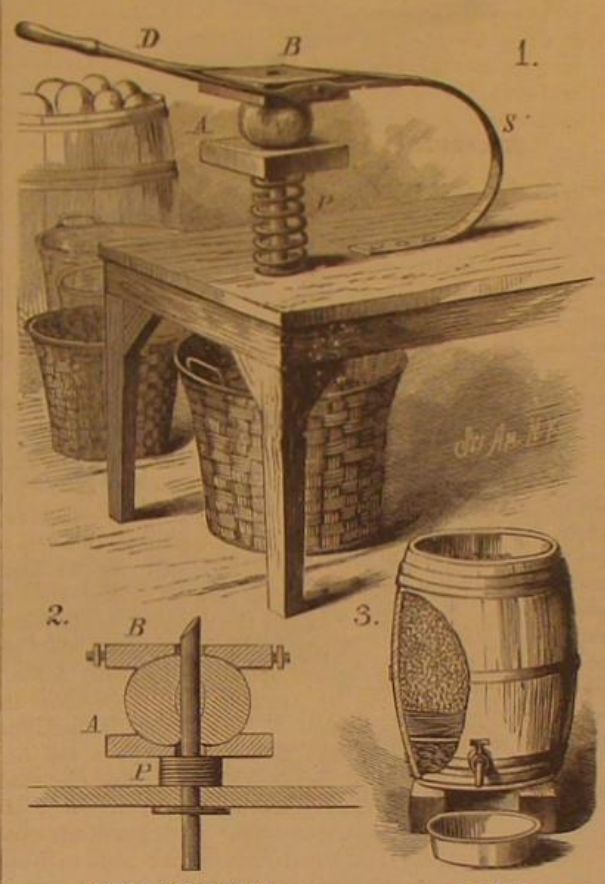
HOW TO MAKE GOOD CIDER AND TO KEEP IT.

In localities where the apple crop is abundant the preparation of cider for market is a profitable industry when intelligently undertaken, and there are few beverages more palatable and less harmful than cider when properly prepared. Unfortunately, there are few farmers who really know how to make good cider or how to care for and keep it when made.

In the first place, apples not perfectly sound and well ripened are not fit for making cider. The russet is one of the best of apples for this purpose, but other and more commonly available varieties need not be slighted.

To prevent bruising the fruit intended for the cider press should always be hand picked. After sweating each apple should be wiped dry, examined, and any damaged or decayed fruit thrown out and used for making vinegar cider.

In the grinding or pulping operation the seed is often crushed and is apt to taint the juice, so that despite the loss and extra time required it is always better to core the apples before grinding them, as the cider will not only taste and look better but keep better. A cheap and handy coring machine is shown in Fig. 1. In this the coring tube, which may be of tin (free from iron rust), projects through a common bench or table, and is surrounded by an ordinary furni-



CORING MACHINE. FILTER.

ture spring, P, which supports a piece of wood, A. This has a hole in the center of it, over and partly into which the apple is seated. The lever, D, on which the piece of wood, B, similar to A, but having an aperture only large enough to admit the coring tube, is loosely hung by side pins, is held in position by the spring, S. The operation of the machine will be readily understood by referring to Fig. 2, in which it is shown in section.

All ironwork about the mill or press (rings, rivets, etc.) should be tinned or coated with good asphaltum varnish, as the color and sometimes taste of the cider is apt to be affected by contact with the rusty metal.

In pressing the pomice many of the best cidermakers prefer to use hair cloth in place of straw between the layers, as it is more cleanly and does not affect the taste of or add anything to the expressed juice.

As the cider runs from the press it should be filtered through a hair sieve into a clean wooden vessel capable of holding as much juice as can be extracted in one day.

Under favorable conditions the fine pomace will rise to the surface in about twenty-four hours—sometimes less—and in a short time grow very thick. Then it should be watched, and when white bubbles begin to appear at the surface the liquid should be drawn off slowly from a faucet placed about three inches from the bottom of the tank, so as not to disturb the lees.

The liquid drawn off should be received in clean, sweet casks, and must be watched. As soon as white bubbles of gas appear at the bunghole it must be drawn off (racked) into clean casks as before, and this racking repeated as often as necessary until the first fermentation is completely at an end. Then the casks should be filled up with cider in every respect like that already contained in it and bunged up tight. Many cider-makers add a gobletful of pure olive oil to the cider before finally putting in the bung and storing.

If it is desired to keep cider perfectly sweet—and this is rarely the case—it should be filtered on coming from the press, and then sulphured, by the addition of about one-quarter ounce of calcium sulphite (sulphite of lime) per gallon of cider, and should be kept in small tight full barrels. The addition of a little sugar—say one-quarter of a pound per gallon—improves the keeping qualities of tart cider.

An easily constructed cider filter is shown in Fig. 3, and consists in a barrel provided with a tap near the bottom. The lower part is filled with dry wood chips covered with a piece of flannel. Over this a layer of clean rye straw is packed down, and then the barrel is nearly filled with clean quartz sand, not too fine.

When the first fermentation of cider has been checked and the liquid barreled it should be allowed to stand until it acquires the proper flavor.

Much of the excellency of cider depends upon the temperature at which the fermentation is conducted. The casks containing the juice should be kept in a cellar, if possible, where the temperature does not exceed 50° Fah. When left exposed to the air, or kept in a warm place, much of the sugar is converted into vinegar and the liquor becomes hard and rough. On the contrary, when the fermentation is conducted at a low temperature nearly the whole of the sugar is converted into alcohol and remains in the liquid instead of undergoing acetification. The change from alcohol to vinegar (acetous fermentation) goes on most rapidly at a temperature of about 95° Fah., and at a lower temperature the action becomes slower, until at 46° Fah. no such change takes place. Independently of the difference in quality of fruit used the respect of temperature is one of the chief causes of the superiority of the cider made by one person over that made by another in the same neighborhood.

The more malic acid and less sugar present the less the tendency to acetous fermentation; hence it often happens that tart apples produce the best cider. But cider made from such apples can never equal in quality that prepared at a low temperature from fruit rich in sugar, which, if properly cared for, will keep good twenty years.

When the first fermentation has subsided and the liquor has developed the desired flavor in storage it is drawn off into other barrels which have been thoroughly cleansed and sulphured, either by burning in the bunghole a clean rag dipped in sulphur, or what is better, by thoroughly rinsing the inside with a solution of bisulphite of calcium prepared by dissolving about a quarter pound of the sulphite in a gallon of water.

The isinglass—six ounces or more (in solution) to the barrel—should be stirred in as soon as transferred, and then a sufficient quantity of preserving powder of bisulphite of lime (not *sulphate* or *sulphide*), previously dissolved in a little of the cider, to entirely check fermentation. The quantity of this substance required rarely exceeds a quarter of an ounce to the gallon of cider. A large excess must be avoided, as it is apt to injuriously affect the taste.

Some makers sweeten their cider by additions, before fining, of sugar or glucose, the quantity of the former varying from three quarters of a pound to one and a half pounds, while as a substitute about three times this quantity of glucose is required. Sweetened cider, when properly cared for, develops by aging a flavor and sparkle resembling some champagnes. Such ciders are best bottled when fined.

The following are the methods by which some of the beverages found in the market under the name of "champagne cider," are made:

1. Cider (pure apple)	3 barrels.
Glucose sirup (A)	4 gallons.
Wine spirit	4 "

The glucose is added to the cider, and after twelve days storage in a cool place the liquid is clarified with one-half gallon of fresh skimmed milk and eight ounces of dissolved isinglass. The spirit is then added and the liquor bottled on the fourth day afterward.

2. Pale vinous cider	1 hogshead.
Wine spirit	3 gallons.
Glucose, about	30 pounds.

The liquid is stored in casks in a cool place for about one month, when it is fined down with two quarts of skimmed milk and bottled.

Much of this and similar preparations are doubtless sold for genuine champagne.

3. Fine apple cider	30 gallons.
Wine spirit	1 gallon.
Sugar	6 pounds.

Fine with one gallon of skimmed milk after two weeks' storage in wood, and bottle.

To Protect Lead against Corrosion.

Prof. Emerson Reynolds describes a process for the protection of lead against corrosion, which is done by coating it with a film of sulphide of lead. He recommends the following method: Take 16 grammes of solid caustic soda, dissolve it in 1·75 liters of water, and add to the liquid 17 grammes of nitrate of lead, or an equivalent of other lead salt, with 250 cubic centimeters of water; raise the temperature of the mixture to 90° C. If sufficient lead salt has been added the liquid will remain somewhat turbid after heating, and must then be rapidly strained or filtered through asbestos, glass wool, or other suitable material, into a convenient vessel. The filtered liquid is then well mixed with 100 cubic centimeters of hot water, containing in solution 4 grammes of sulpho-urea or thio-carbamide. If the temperature of the mixture be maintained at about 70° C., deposition of sulphide of lead or galena, in the form of a fine adherent film or layer, quickly takes place on any object immersed in or covered with the liquid, provided the object be in a perfectly clean condition and suitable for the purpose. When the operation is properly conducted a layer of galena is obtained which is so strongly adherent that it can be easily polished by means of the usual leather polisher. It is not necessary to deposit the galena from hot liquids, but the deposition is more rapid than from cold solutions.

The Coast Survey.

Though hampered by lack of means, the U. S. Coast Survey is steadily prosecuting a very important work. The extension of the triangulation from the coast inland, begun by Peirce, is going on under Superintendent Patterson in twenty-five States.

The Mississippi River has been surveyed as far up as Memphis, nearly nine hundred miles above its mouth. Important surveys and explorations have been made in far-off Alaska; soundings across Behrings Strait have developed a remarkable ridge extending between Asia and America—a circumstance hitherto unknown. The new surveys of the James and the Delaware are nearly completed, and the entire Gulf of Mexico sounded and mapped from the Mississippi to Yucatan and from the Bahamas to the coast of Mexico. To the present superintendent belongs also the "Coast Pilot," a directory of the Atlantic and Gulf coasts, long urgently needed by seamen. Although Bache had some idea of a publication of this kind it never took shape in his mind, and he left behind him only a few vague and disconnected notes of little practical value. Patterson conceived and put into execution the unique and elaborate plan which is now being carried out, and which will when completed form the most complete series of coast directories ever published by any nation.

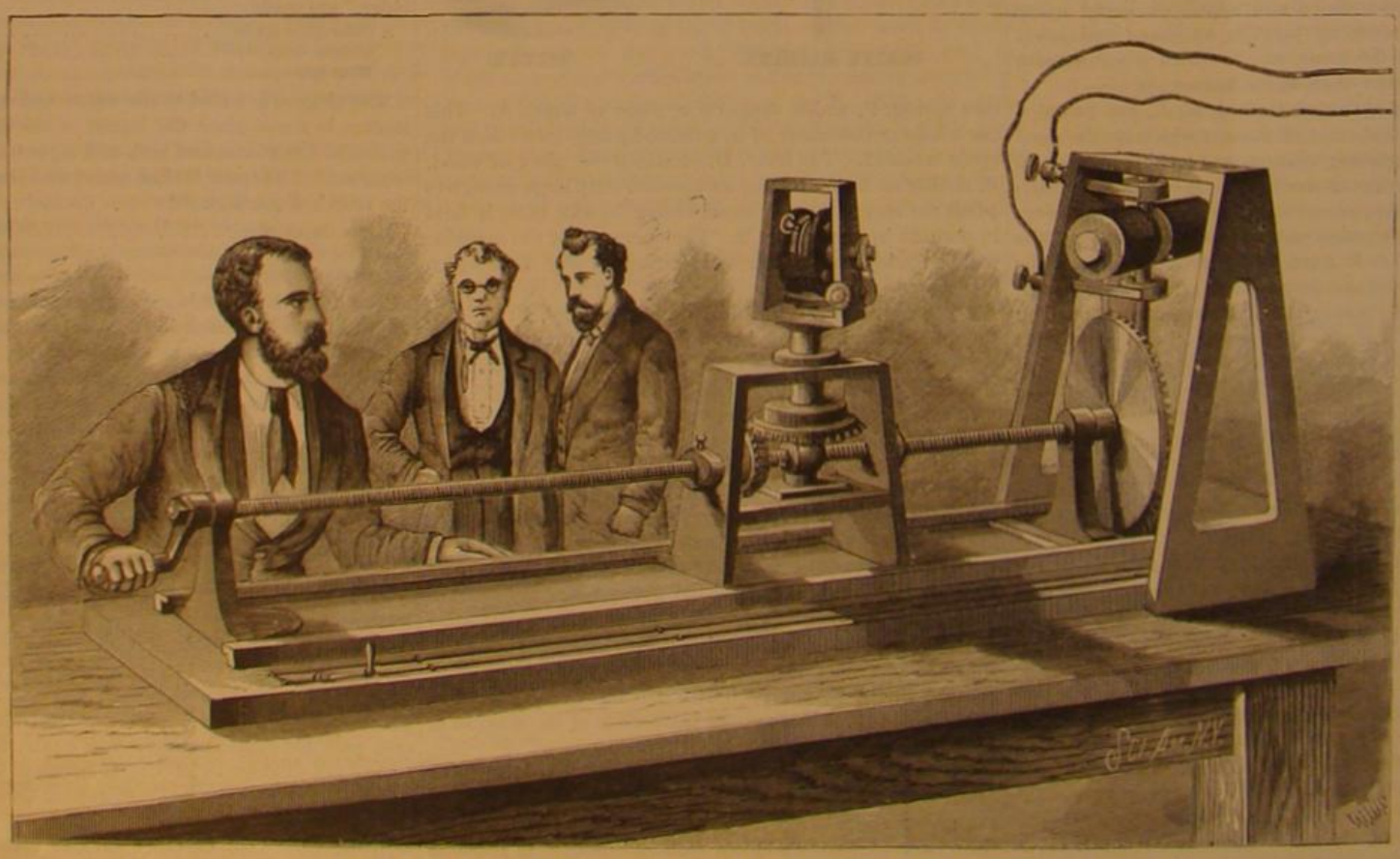
This plan proposes the publication of (1) a very complete description of coasts, bays, and rivers, as far as the head of navigation—a carefully prepared itinerary, in fact—giving in plain language detailed information on every possible question of interest to mariners—this to be issued in a series of five large volumes, illustrated with valuable views and charts; (2) a more condensed series in three volumes, embracing the same extent of coast but with less detail; (3) a single "handy volume," containing sailing directions for the whole coast from Maine to Texas. A work of a similar character is likewise to be prepared for the Pacific coast.

Meanwhile the topographical and hydrographic work is being rapidly executed—the latter being now almost entirely performed by officers of the navy, who, since the close of the war, have become once more available for marine surveying. In short, but few years can elapse ere the whole of the Atlantic coast and that of the Gulf of Mexico will show an unbroken border of surveyed topography and hydrography extending from Passamaquoddy to the Rio Grande.

NOVEL MACHINE FOR DEMAGNETIZING WATCHES.

With the extensive use of dynamo-electric machines there arises a difficulty which is experienced by almost every one who comes into proximity to one of these machines; that is, the magnetization of one's watch so that its time-keeping qualities are seriously interfered with, or it stops altogether. Several methods of demagnetizing watches have been proposed, some of which operate with a certain degree of success, but all are more or less troublesome and uncertain.

Mr. H. S. Maxim, the well known mechanical and electrical engineer of this city, has lately perfected a piece of apparatus which is exceedingly simple and perfect in its action, and it may be used not only on watches and other small machinery affected by magnetism, but also on tools of any form or size.



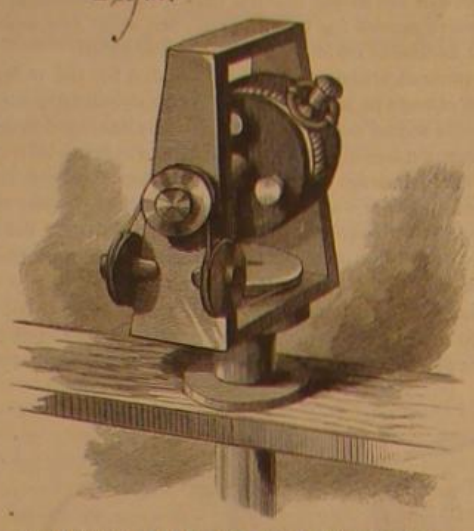
MAXIM'S MACHINE FOR DEMAGNETIZING WATCHES.

The device consists of a bar electro-magnet, mounted on a vertical spindle so as to revolve endwise in a horizontal plane. It receives a current from a dynamo electric machine or galvanic battery, which is transmitted to the magnet wires through springs bearing on the insulated collars above and below the magnet, these collars being connected with the terminals of the magnet wire. The frame supporting the magnet spindle is attached to the end of a bed piece having on its upper surface ways for the carriage supporting the watch. This carriage is moved along on the bed piece by a screw having at one end a crank and at the other end a bevel wheel which meshes into a pinion on the magnet spindle.

The watch holder is mounted on a hollow vertical spindle opposite the poles of the magnet, and takes motion from the screw through a bevel wheel fixed to its lower end, and driven by a pinion carried by the carriage but rotated by the screw, the screw being slotted and the pinion being splined for that purpose. The watch holder is supported by a frame attached to the end of the hollow vertical spindle, and a small wheel is supported inside of the watch holder frame by a fixed shaft running downward through the hollow spindle and attached to the lower portion of the carriage.

The chuck in which the watch is placed is revolved by a

Fig. 2.



ENLARGED VIEW OF WATCH HOLDER.

belt passing over a pulley on the end of its shaft, under guide pulleys and around the fixed wheel, so that as the watch holder frame is revolved in a horizontal plane the watch is revolved in an ever-changing vertical plane.

The operation of demagnetizing a watch is very easy. The watch is placed in the holder, and the carriage is moved up as near the electro-magnet as possible. The shear nut on the carriage is then brought into engagement with the screw, and the magnet is rotated rapidly, the watch at the same time receiving a compound rotary motion which brings every side of the watch in opposition to the poles of the magnet. The electrical circuit is thus completed through the magnet by means of the switch at the side of the bed piece, and the rotary motion is continued until the carriage has reached the end of the screw remote from the magnet, when the electrical circuit is broken and the work is completely done. It was our good fortune to witness this operation on a watch that was so thoroughly magnetized as to be incapable of making a single stroke of the escapement lever. When it was taken out of the machine its motion was perfectly free and normal, and the most delicate tests failed to reveal a trace of magnetism.

The theory of the action of this machine seems to be that the watch is subjected to rapid reversals of polarity in a gradually weakened magnetic field until the final reversals were practically *nil*.

Mr. Maxim informs us that the machine illustrated is intended for the Paris Electrical Exhibition. That is certainly a good field for an exhaustive trial. Messrs. L. & A. Mathey, the well known importers of fine watches, No. 16 Maiden Lane, this city, have the exclusive agency for this ingenious instrument. It may be seen in operation at their establishment, where watches may also be sent for demagnetization.

Improvements in New York Harbors.

The annual report of General Newton to the chief of engineers, just submitted, describes at length the progress made last year in the improvement of navigable channels about New York. The most important operations were at Hell Gate. At Hallett's Point there has been continous work in grappling and removing the *débris* from the explosion of 1876. During the last fiscal year (ending June 30, 1881) there have been removed 9,823 tons of broken stone. The total amount of stone removed from this reef since the explosion is 81,907 tons. The full depth of 26 feet at mean low water has been obtained for the area embracing about two-thirds of the reef. Over the remaining one-third there are still shoal points having 19 to 20 feet over them at mean low water.

The work at Flood Rock has also been carried on without interruption. The length of galleries driven during the year was 6,211 lineal feet, and the stone removed amounted to 21,528 cubic yards. The total length of galleries on June 30, 1881, was 13,523 lineal feet. The total number of cubic yards of stone in place removed was 39,608. The work of excavating now proceeds almost as rapidly as it is possible to push it with the due regard to economy; and it is probable that it will require nearly two years to complete the excavations preparatory to the final explosion. The area already covered by the excavations is 4 844-1,000 acres. As the galleries extended to greater distances from the shaft it became necessary to provide means for ventilation, for which purpose a ventilating fan twelve feet in diameter driven by a twelve by eighteen vertical engine was placed at the opening of the shaft.

It is estimated that nearly two and a quarter million dollars will be required to complete the work, including the removal of the *débris* at Hallett's Point to a depth of twenty-six feet at mean low water, removing Heel Tap and the reef at the North Brother, with some work on Frying Pan, Pot Rock, and in extending channels and excavations in the middle reef (Flood Rock.)

In Buttermilk Channel a considerable amount of dredging has been done, about 80,000 cubic yards of material in place having been removed, increasing the width and depth of the channel. Originally the channel, which lies between Governor's Island and the Brooklyn shore, was obstructed by a large shoal with a minimum depth of 9½ feet at mean low water. It lay in the direct track of navigation and too near the wharves of Brooklyn for the safe passage or maneuvering of large vessels.

No work was done upon the improvement of Gowanus Bay (Brooklyn), or upon the proposed ship canal at Harlem River, the right of way not having been secured by the commissioners appointed by the Supreme Court. A small amount of diking and dredging has been done at Flushing Bay, and also at Newtown Creek.

Curious Experiment in Magnetism.

The following experiment is described by M. Obalski, in a communication to the Academie des Sciences:

Two magnetic needles are hung vertically by fine thread, their unlike poles being opposite one another. Below them is a vessel containing water, its surface not quite touching the needles; they are hung so far apart as not to move toward one another. The level of the water is now quietly raised by letting a further quantity flow in from below. As soon as the water covers the lower ends of the needles they begin to approach one another, and when they are nearly immersed they rush together. The effect appears to be due to the fact that when the gravitation force downward is partly counteracted by the upward hydrostatic force due to immersion, the magnetic force, being relatively greater, is able to assert itself.

OLD MEN AS SCIENTISTS.—Recently Prof. Huxley said that 99 men out of every 100 became simply obstructive after 60 years old, and were not flexible enough to yield to the advance of new ideas. The world, he thought, would be benefited by any man who had taken part in science being strangled after 60.

THE GUACHARO, OR OIL BIRD.

In the deep rocky caverns of the mountains of Central America there lives a wonderful bird, which undoubtedly exhibits the principal characteristics of the night swallows, but nevertheless preserves an independent character, and may therefore be considered as an archetype of a distinct sub-family, called *Steatornina*, or oil birds.

The guacharo of Venezuela is fifty-five centimeters long, and double that breadth from tip to tip of wings. Its body is very slender, the head broad. The bill is longer than it is broad, curved considerably, and has a prominent overhanging point, and its edges are indented. The claw is very powerful, the leg short and bare, the wings very long and pointed. The tail is considerably shorter than the wings and rounded. The bill is surrounded with bristles, and little bristly feathers border the eyelid and protect the large half globular eye. A layer of fat extends under the chin and surrounds the intestines, so that they may be said to be embedded in fat. The color of the feathers is a beautiful chestnut brown mottled with dark brown. Upon the under side of the wings and the upper part of the tail there are distinct lance-shaped yellowish white spots with a narrow border. On the upper wing covers these spots are larger and elongated. The eye is dark, the bill reddish brown, the foot yellowish brown. The sexes are not distinguished by their coloring.

Alexander von Humboldt discovered the guacharo in the year 1799 in the large rocky caverns of Caripe. Later travelers have found it in other rocky clefts, such as are frequently found in the Andes. The knowledge which we have obtained of this remarkable bird is tolerably complete, but there remains yet much to describe. The following account is compiled of the most important statements of Humboldt and Grosz.

Humboldt says the caverns of the Guacharos do not lie in the valley of Caripe, but three miles from the monastery toward the west-southwest.

On the 18th of September we set out for the Sierra of Guacharo, accompanied by the Indian alcaldes and the most of the monks from the cloister. A narrow path led us first for about half an hour southward over beautiful turf-covered plains; then we turned westward up to a small river which springs forth from a cavern. For about three-quarters of an hour the way leads upward, sometimes in the water (which is not deep) and sometimes between the river and a rocky wall, the ground being very slippery and marshy. Numberless earth-falls, and the trunks of trees lying around, over which the mules make their way with difficulty, render this part of the way very wearisome.

Standing at the foot of the high Guacharo mountain, not more than four hundred paces from the mouth of the cavern, no place of entrance can be seen. The river runs through a gorge which the water has dug out for it, and the road passes under an overhanging rock, so that the sky cannot be seen. The road winds with the river, and at the last bend one stands before the immense mouth of the cavern. The view is magnificent even to eyes familiar with the picturesque scenery of the Alps, for the luxuriant growth of tropical plants invests the mouth of these caves with a peculiar character.

The Guacharo caverns open directly upon a perpendicular rocky wall. The entrance is turned to the south; there is an arch twenty-five meters broad and twenty-two meters high. Gigantic trees stand upon the rocks over the grotto. The mamei and the genipa tree, with broad glittering leaves, stretch their branches straight toward the heavens, while the courbaril and erythrina spread themselves out and form a thick green arch. Oxalis and orchids of rare species grow in the crevices of the rock, while climbing plants swinging in the wind twine themselves together before the entrance to the cavern.

But the growth of plants not only adorns the outside of the arches; they penetrate into the interior of the caverns. These plants extend into the caves of Caripe as in the deep rocky crevices of the Andes, and only cease thirty or forty paces from the entrance. We traveled a long distance before it was necessary to light the torches. The daylight penetrates so far because the caverns have only one passage, which extend from southeast to northwest. When the light begins to disappear the hoarse cries of the nocturnal birds are heard. One can hardly conceive of the fearful noise which thousands of these birds produce in the depths of the caverns. The piercing, penetrating cries of the guacharos resound in the rocky arch, and from the depths of the cavern the echo comes back.

The Indians showed us the nests of these birds, while they fastened their torches to a long pole. The roof, twenty-three meters above our heads, with funnel-shaped perforations, swarms with the nests. The deeper one penetrates into the caverns the more birds are frightened up by the light of the torches, and the greater the tumult.

The guacharo leaves the cavern at the approach of night, especially when the moon shines. He eats very hard seeds and fruit; and the Indians assert that he never eats insects, and it is only necessary to compare the bills of the guacharo and the goat-suckers to see that their habits of life must be quite different.

THE GUACHARO, OR OIL BIRD.

Every year, on St. John's or Midsummer's Day, the Indians enter the caves of the Guacharos, and with long poles strike down the nests, killing many of the young birds. The old ones, trying to defend their brood, fly about the heads of the Indians with fearful cries.

The young birds which fall to the ground are dressed upon the spot. The abdominal region is covered with fat, and a layer of fat runs from the under part of the body to the back part, and forms a kind of knob between the legs. These birds are not exposed to the daylight, and, using their muscles very little, become so fat that they remind us of the ancient experiments of cramming geese and cattle. It is well known that darkness and quiet promote the growth of fat.

The European nocturnal birds are lean, for they do not live upon seeds and fruit like the guacharos, but depend upon the scanty product of their chase.

At the time of the "fat harvest," as it is called in Caripe, the Indians build huts of palm leaves at the entrance to these caverns. Here the fat of the young freshly killed birds is tried out and poured into clay vessels. This fat is known by the name of guacharo fat or oil. It is semi-fluid, clear, and odorless, and so pure that it may be kept more than a year without becoming rancid. No other fat is used in the kitchen of the monastery at Caripe, and the food does not receive any unpleasant taste or odor from its use.

The quantity of oil which the Indians prepare every year bears no proportion to the number of birds massacred. They obtain only about one hundred and fifty or sixty flasks of entirely pure oil. The oil remaining, which is not so clear, is preserved in earthen vessels.

The members of an Indian family descended from the first settlers in the valley declare themselves to be the rightful owners of the caverns, and lay claim to the exclusive right to the oil, but in consequence of the discipline of the monastery, their right is at the present time only a right of honor. The Indians furnish oil for the constant light in the church; the rest they declare should be purchased from them.

The guacharo family would have been long since extinct if several circumstances had not worked together for their preservation. The Indians do not venture far into the caverns on account of their superstitious fears. These birds also nest in neighboring caverns which are inaccessible to the Indians. Perhaps the large caverns are peopled again with settlers from the smaller nesting places, for the missionaries say that the number of birds have not perceptibly diminished.

Young guacharos have been carried into the harbor of Cumana, and have lived several days without eating when the seeds given them did not suit them. If the crop of the young bird is cut open it will be found to contain many kinds of hard dry seeds, which are called guacharo seeds. They are carefully collected by the Indians, and used medicinally as a remedy for fever.

It was with great difficulty that the Indians were induced to pass over the front part of the cavern, and it needed all the authority of the priests to prevail upon them to go as far as the place where the ground suddenly rises sixty degrees and the river forms a subterranean fall. The roof sinks down and the cries of the guacharos become so piercing that no persuasion could induce the Indians to penetrate further into the cavern, and we were obliged to give up to the cowardice of our guide and return.

These caverns of the nocturnal birds are horrible, mysterious places for the Indians. They believe that the souls of their ancestors hold their gloomy state in their innermost recesses, and, when they hear at night a loud wailing cry, set it down at once as proceeding from some wretched spirit longing to resume its body and lamenting its sad doom. To die is often called by the Indians "joining the guacharos."

The magicians and poison mixers hold their nightly juggleries at the entrance to the caverns in order to exorcise the chief of the evil spirits —Ivorokiamo. The caverns of Caripe are the Tartarus of the Greeks, and the guacharos that flutter with mournful cries over the water may be compared to the Stygian birds.

Grosz visited the ravine of Icononzo, in New Granada, which passes through a sandstone rock, and a wild mountain stream rushes through it. He lowered himself by means of a rope, sat down on a narrow projection, and was immediately surrounded by a great number of these birds, who thought it necessary to attack him in order to defend their nests. The specter-like birds whizzed around so near the observer that they touched him with the points of their wings, and the cries of the hundreds and thousands of these birds were deafening. In flying they extend their wings and tail in the form of a fan. Every other movement seems to be clumsy. Their gait is a wretched creeping motion, and they use their wings to assist them. Grosz also states that their nourishment consists of hard dry fruits; they do not spit out the seeds, but they are thrown out with the excrement. The greedy young birds crowd around the nests, and by degrees dispose of the excrement and seeds, which sometimes reaches an enormous height.

The young are sadly misshapen, and are not able to move until their feathers are developed. If they are provoked they fall angrily upon one another, pecking with their bills whatever comes with their reach, even their own feet or wings, and if they once seize upon anything they let it go very unwillingly. Grosz attempted to rear one of the young birds, but was not in a position to give it its usual food, and

it died after a few days. The male and female brood in turn. The eggs, which are about the size of those of a house pigeon, differ from those of the real goat-suckers in form and coloring. The shell is moderately strong, chalky white, marked with brownish spots.—*Brehm's Animal Life.*

"Dragons in their Prime."

In the latter part of June, Professor Samuel S. Lockwood, of New Jersey, discovered near Freehold, in that State, parts of the skeleton of a cretaceous sea serpent, which Professor Cope has named the *Clidastes conodon.* Enough of the skeleton has been uncovered to show that its length must have been from sixty to eighty feet. Numbers of huge vertebræ, and a part of the lower jaw containing sixteen teeth, were first found, much to the astonishment of the country people. The teeth, especially the middle ones, have fore-and-aft cutting edges, and so perfect are they that the rich enamel is in as good a condition as if the creature had but yesterday been stranded on the beach. The remains of the monster have been sent by Prof. Lockwood to Prof. E. D. Cope, of Philadelphia, for examination; and to give an idea of the snake-like appearance of this monster, he says:

"To prevent their contortions from dislocating the vertebral column, they had an additional pair of articulations at each end, while their muscular strength is attested by the elegant striæ and other sculptures which appear on all their bones. A smaller species of elegant proportions has been called C. *toritor* (Cope). Its slenderness of body was remarkable, and the large head was long and lance-shaped. Its lithe movements brought many a fish to its knife-shaped teeth, which are more efficient and numerous than any of its relatives. It was found coiled up beneath a ledge of rock, with its skull lying undisturbed in the center."

Its companions in the ancient sea, says a writer in the *Sun*, were not less wonderful, according to his examinations. The limbs were probably two pairs of paddles. In the best known species, twenty-two feet represent the neck in a total length of fifty feet. It is the *Elasmosaurus platyurus* (Cope), a carnivorous sea reptile, no doubt, adapted for deeper waters than many of the others. Like the snake bird of Florida, it probably often swam many feet below the surface, raising the head to the distant air for a breath, then withdrawing it and exploring the depths forty feet below without altering the position of its body. Judging from the localities in which the bones have been found, it must have wandered far from land; and that many kinds of fishes formed its food is shown by the teeth and scales found in the position of its stomach.

A second species of somewhat similar character and habits differed very much in some points of structure. The neck was drawn out to a wonderful degree of attenuation, while the tail was relatively very stout, as though to balance the anterior regions while capturing its food. It was a powerful swimmer, its paddles measuring four feet in length, with an expanse, therefore, of about eleven feet. It is known as *Polycotylus latipinnis* (Cope). Researches into their structure have shown that they were of wonderful elongation of form, especially of tail; that their heads were large, flat, and conic, with eyes directed partly upward; that they were furnished with two pairs of paddles, like the flippers of a whale, attached by short wide peduncles to the body. With these flippers and the eel like strokes of their flattened tail they swam, some with less, others with greater speed. They were furnished, like snakes, with four rows of formidable teeth in the roof of the mouth. Though these were not designed for mastication, and without paws for grasping could have been little used for cutting, as weapons for seizing their prey they were very formidable.

Swallowing their prey entire, like snakes, they were without that wonderful expansibility of throat due in the latter to an arrangement of levers supporting the lower jaw. Instead of this, each half of that jaw was articulated, or jointed at a point nearly midway between the ear and the chin. It was of the ball and-socket type, and enabled the jaw to make an angle outward, and thus widen the space inclosed between it and its fellow. The arrangement may be easily imitated by directing the arms forward, with the elbows turned outward, and the hands placed near together. The ends of these bones were in the *Pythonomorpha* as independent as in the serpents, being only bound by flexible ligaments. By turning the elbows outward and binding them, the space between the arms becomes diamond-shaped, and represents exactly the expansion seen in these reptiles to permit the passage of a large fish or other body. The arms, too, will represent the size of jaws attained by some of the smaller species. The outward movement of the basal half of the jaw necessarily twists in the same direction the column-like bone to which it is suspended. The peculiar shape of the joint by which the last bone is attached to the skull depends on the degree of twist to be permitted, and therefore to the degree of expansion of which the jaws were capable. As this differs much in the different species, they are readily distinguished by the column or "quadrate" bone when found. There are some curious consequences of this structure, and they are here explained as an instance of the mode of reconstruction of extinct animals.

The habit of swallowing large bodies between the branches of the under jaw necessitates the prolongation forward of the mouth of the gullet; hence the throat in the *Pythonomorpha* must have been loose and almost as baggy as a pelican's. Hence these creatures must have uttered no other sound than a hiss, as do animals of the present day which have a similar structure, as, for instance, the snakes. The tongue must have been long and forked, because its position was still anterior to the glottis, so that there was no space for it except it were inclosed in a sheath beneath the windpipe when at rest, or thrown out beyond the jaws when in motion. Such is the arrangement in the nearest living forms, and it is always in these cases cylindric and forked.

Another sea serpent that once roamed over New Jersey, and whose bones are now and then found by the farmers, is known to science as the *Mosasaurus;* and if the reader can imagine a monster eel with a blunt head like a frog, and which if coiled up in Broadway would completely block the street, he can perhaps form something of an idea of this creature. On the possibility that some of these creatures may have outlived their era, as have other forms, the existence of the sea serpent of to-day depends. Agassiz was a firm believer in the fact, and a throng of trustworthy witnesses have attested to its appearance.

Additions to the Museum of Natural History, Manhattan Square.

By the liberality of Morris K. Jesup an economic department has lately been established in the Museum of Natural History. The first considerable contribution to this department is to be a botanical collection to illustrate the economic value of our forests. This will include specimens of all the woods used for any purpose in architecture, building, or the arts. The specimens will be trunks five feet high, transverse, longitudinal, and oblique sections of the wood, polished and unpolished, besides leaf, flower, and fruit, and photograph or colored drawing of a specimen of each species in its most perfect development. In addition to the label on each specimen, where examples of the same species occur in the park, their location will be indicated. This collection will be made under the direction of Professor C. S. Sargent, who is at the head of a corps of workers now preparing an elaborate census report on our forest wealth.

For the same department a collection of economic geology will be prepared under the supervision of Dr. George W. Hawes, who, with able assistants, is preparing for the tenth census a report on the quarries of ornamental and building stone. An exhaustive series of specimens of this character, together with maps, plans, and photographs, will be most instructive to artisans and pupils of the public schools. These census volumes will be distributed among the libraries and learned institutions all over the world, and they will be guides and catalogues to the illustrative specimens deposited in the Museum. The rapidity with which this costly collection is growing will make necessary the speedy erection of another section of the building.

The high value of the present contents of the Museum is shown by the following summary: (1.) A collection of mammals equal in extent and variety to all others in the country combined. (2.) A collection of birds more perfect in condition and mounted in more natural attitudes as a whole than any other in the world. (3.) A collection relating to the archæology of America, which, when the specimens here belonging to men working in the Museum and the specimens belonging to the Museum are taken together, is more complete than that under any one roof of the country. (4.) A collection illustrating the ethnology of the Pacific Islands, one of the most complete in the world. (5.) A palæozoic collection, mainly of fossils from America, better than anything of the kind in Europe. (6.) A collection of rocks, partly owned by the Museum and partly deposited here by the National Museum, comprising all the rocks gathered in the country. To these should be added the libraries on special subjects, noteworthy among which is that upon fishes, collected by J. Carson Brevoort, and presented by Robert L. Stuart. The next in value relates to shells. It was collected by Dr. John C. Jay and presented by Miss C. L. Wolfe.

Failure of Shad Hatching in Brackish Water.

Several experiments to test the feasibility of hatching shad in brackish water have been made by the Connecticut Fish Commission at Saybrook, the results being invariably negative. In only one instance did the eggs show signs of life. In that case, twelve hours or more after impregnation the eye spots of the little fish were visible under the microscope, and later the backbone. There was life, but it never advanced beyond this first stage. On examining these good eggs four hours after they were placed in the salt water, the microscope showed that they were covered with minute indentations, like pin pricks, and in seven hours these were more strongly marked. They continued to grow, and finally the eggs burst and only the shells were left. Thinking that this might be due to the agitation of the water on the surface, eggs were put in a tight covered box, which was sunk to the bottom, but no better success was attained. Pans were also taken to the shore, to avoid possible disturbance by the motion of the boat, but the result was the same. The Commissioners decide that shad cannot be hatched in salt or brackish water.

The Yellow Water Lily.

The first blooming of a yellow water lily (*Nymphæa flava*) in Cincinnati has called out in the *Commercial* the following facts with regard to the history of this recently rare plant:

"John James Audubon first discovered the yellow water lily in Florida, and mentioned it; but none of the botanists of the time could ever find it, and it was concluded that Audubon must have been mistaken. A few years ago, however, Mrs. Mary B. Treat rediscovered the plant in Florida. Since then specimens of it have been sent to various parts of the world. It is, however, a rare plant, and until this summer has never been known to bloom away from its native home. There is another specimen now in bloom at the Kew Gardens, London. In shape this rare flower resembles the well known white water lily. It is smaller, however. The blossom is of a bright canary yellow, measuring nearly two inches in diameter. The leaves are very beautiful. They are heart-shaped and variegated in color. The top is green, flecked with purple, and the under side is bright purple red."

Several blooms of the *Nymphæa flava* have recently been brought to this city from a near-by town on the Hudson, from which we infer that the *Commercial* overstates its rarity.

An Investigation of the Arid Regions.

The arid regions lying just to the east of the Rocky Mountains—the Great American Desert of our earlier geographers—is rapidly becoming of importance to agriculture through the encroachment of farms and the rapid development of stock raising. The region comprises the western portions of Dakota, Nebraska, and Kansas; the eastern portion of Montana, Wyoming, Colorado, and New Mexico; and about one-third of the State of Texas.

Last winter Congress appropriated $15,000 to be used in procuring data touching the agricultural needs of this region; and recently the Commissioner of Agriculture has appointed two commissions, one to study the general conditions and agricultural capacities of the region, the other to select sites for an experimental system of artesian wells.

The first commission comprises Professor E. W. Hilgard, of California; ex-Governor Robert Furnas, of Nebraska; and T. C. Jones, of Delaware, Ohio. They are to investigate and report upon the following subjects:

First—The grape culture and wine making of the Pacific coast as it now exists, and especially the inducements offered by the soil and climate of New Mexico for vine culture in reference to supplying the market with valuable grapes, wines, and raisins.

Second—The annual industry of that section of our country, its value, condition, and management generally, including horses, cattle, sheep, and wine.

Third—The agricultural methods prevailing in the region designated, including cereal crops, their value, amount in aggregate, and average yield per acre; the general management of land for horticultural as well as agricultural purposes, and the modes of fertilization.

The second commission mentioned is composed of Professor C. A. White, of Greeley, Colorado, and Professor Samuel Aughey, of Lincoln, Nebraska. The work will probably be begun in the southern portion of the arid area, near the Rio Grande. Professor Powell, of the Geological Survey, is quoted by Commissioner Loring as advising the selection of sites for wells on the eastern slope of the Rocky Mountains near enough to obtain the advantages of the dip in structure, and sufficiently far away, of course, to avoid faults and displacements by fracture. He thinks it probable that the water will be found in glacial and other quaternary deposits, and in tertiary deposits of the country. His reasons for selecting this area are these: First, it is the area of a large amount of stock raising, in which a water supply on the broad area lying between the streams is imperatively necessary. Again, in this area, the structure is more homogeneous than in any other portion of the United States, so that what is determined in this area would be of wide value, while what could be determined in any other portions of the United States would have only a local value.

Both commissions are expected to report results to the Department of Agriculture by the beginning of next year.

The Weakening of Steel by Heat.

Examples of the mysterious failure of steel are not uncommon, and although much of the mystery which used to attend the qualities of steel is disappearing before modern research, it cannot be said that increased knowledge always leads to better confidence. One of the peculiarities of spring and tool steel which has lately been investigated by several observers—Mr. Adamson among the number—is the known liability of steel that is very flexible when cold to break when at the blue annealing temperature. It has sometimes been supposed that only inferior metal is subject to this tendency; but the workers in Ural iron, which is remarkably pure in quality, have often observed the same action. Mr. Adamson has found that steel of this kind becomes actually "powdery" at a temperature of between 500° and 700° Fah., or the point at which willow twigs take fire; and he has decided that this is the point when the metal is at its weakest, possessing little or no coherence. This phenomenon, if it can be substantiated as universal or even frequent, is suggested as a possible explanation of a large number of accidents, such as the breaking of steel tires, shafts, and parts of machine tools which may be strong enough when cold, but being raised to the stated temperature by the effect of friction, etc., they are not able to withstand the slightest strain, and, in fact, drop into pieces by their own weight. The quickness with which broken parts of machinery or tools would, under ordinary circumstances, cool down, and therefore regain their strength, would naturally lead an ordinary observer away from the truth which Mr. Adamson claims to have discovered.

DECISIONS OF THE COURTS RELATING TO PATENTS.

United States Circuit Court.—District of Massachusetts.

AMERICAN BELL TELEPHONE COMPANY *et al.* *vs.* ALBERT SPENCER *et al.*

Opinion of the Court, June 27, 1881.

Lowell, J.:

The bill alleges an infringement of two patents granted to Alexander Graham Bell. The defendants admit that they have infringed some valid claims of the second patent, but the plaintiffs are not content with this admission; they rely besides upon the fifth claim of the first patent, which is much more comprehensive in its scope.

Patent No. 174,465, issued to Bell, dated March 7, 1876, is entitled "Improvement in Telegraphy," and is said in the specification to consist in "the employment of a vibratory or undulatory current of electricity in contradistinction to a merely intermittent or pulsatory current, and of a method of and apparatus for producing electrical undulations upon the line wire." The patentee mentions several advantages which may be derived by the use of this undulatory current, instead of the intermittent current, which continually makes and breaks contact, in its application to multiple telegraphy; that is, sending several messages, or strains of music, at once over the same wire; and the possibility of conveying sounds other than musical notes. This latter

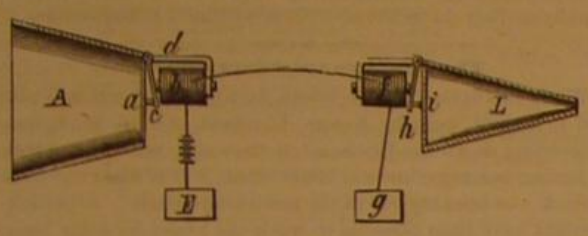


Fig. 7 Bell's Patent, March 7, 1876.

application is not the most prominent in the specification; though, as often happens, it has proved to be of surpassing value. This part of the invention is shown in Fig. 7 of the drawings, and is thus described in the text:

"The armature, *c*, Fig. 7, is fastened loosely by one extremity to the uncovered leg, *d*, of the electro-magnet, *b*, and its other extremity is attached to the center of a stretched membrane, *a*. A cone, A, is used to convey sound vibrations upon the membrane. When a sound is uttered in the cone, the membrane, *a*, is set in vibration, the armature, *c*, is forced to partake of the motion, and thus electrical undulations are created upon the circuit, E, *b*, *c*, *f*, *g*. These undulations are similar in form to the air vibrations caused by the sound; that is, they are represented graphically by similar curves. The undulatory current passing through the electro-magnet, *f*, influences its armature, *h*, to copy the motions of the armature, *c*. A similar sound to that uttered in A, is then heard to proceed from L."

With the Figure 7 before us, this description is readily understood. A cone of pasteboard, or other suitable material, has a membrane stretched over its smaller end; at a little distance is a piece of iron magnetized by a coil through which is passing a current of electricity. When sounds are made at the mouth of cone, A, the membrane vibrates like the drum of a human ear; and the armature, which is directly in front of the magnet, vibrates with the membrane, and its movements cause pulsations of electricity like those of the air which excited the membrane, to pass over the wire; and the wire stretches to another similar magnet and cone with its membrane and armature. The second armature and membrane take up the vibrations and make them audible by repeating them into the condensing cone, L, which translates them into vibrations of the air.

The defendants insist that the instrument represented in Fig. 7 will not transmit articulate speech; that this great result has been reached by Mr. Bell entirely through the improvements described in his second patent, such as the substitution of a metal plate for the stretched membrane, and some others.

The importance of the point is, that if Bell, who is admitted in this case to be the original and first inventor of any mode of transmitting speech, has not completed his method, and put it into a working form when he took his first patent, he may lose the benefit of his invention; because, in his second patent, he makes no broad claim to the method or process, but only to the improvements upon a process assumed to have been sufficiently described in his first patent.

There is some evidence that Bell's experiments with the instrument, described in Fig. 7, before he took out his patent, were not entirely successful; but this is now immaterial, for it is proved that the instrument will do the work, whether the inventor knew it or not, and in the mode pointed out by the specification.

The fifth claim of this patent is for

"The method and apparatus for transmitting vocal or other sounds, telegraphically, by causing electrical undulations, similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth."

The defendants use a method and apparatus for transmitting vocal sounds, which resemble those of the plaintiffs in producing electrical undulations copied from the vibrations of a diaphragm, and sending them along a wire to a similar receiver at the other end. The specific method of producing the electrical undulations is different. It is made on the principle of the microphone, which has been very much improved since the date of the first Bell patent.

If the Bell patent were for a mere arrangement, or combination of old devices, to produce a somewhat better result in a known art, then, no doubt, a person who substituted a new element not known at the date of the patent, might escape the charge of infringement. But Bell discovered a new art—that of transmitting speech by electricity—and has a right to hold the broadest claim for it which can be permitted in any case; not to the abstract right of sending sounds by telegraph, without any regard to means, but to all means and processes which he has both invented and claimed.

The invention is nothing less than the transfer to a wire of electrical vibrations like those which a sound has produced in the air. The claim is not so broad as the invention. It was, undoubtedly, drawn somewhat carefully in view of the decision in *O'Reilly vs. Morse*, 15 How. 62, and covers the method and apparatus; that is, any process and any apparatus of substantially similar character to those described. The patent points out distinctly that the undulations may be produced in other modes besides the vibration of an armature in front of a magnet; and the defendants make use of a mode not wholly unknown at that time, though much improved, in creating their undulations.

It seems to me that the defendants use both the method and the apparatus of Bell. The essential elements of the method are the production of what the patent calls undulatory vibrations of electricity to correspond with those of the air, and transmitting them to a receiving instrument capable of echoing them. Granting that the defendants' instrument for converting the vibrations of the diaphragm into vibrations of electricity is an improvement upon that of the plaintiffs, still it does the same sort of work, and does it in a mode not wholly unknown at the date of the patent; though I do not consider that material.

An apparatus made by Reis, of Germany, in 1860, and described in several publications before 1876, is relied on to limit the scope of Bell's invention. Reis appears to have been a man of learning and ingenuity. He used a membrane and electrodes for transmitting sounds, and his apparatus was well known to curious inquirers. The regret of all its admirers was, that articulate speech could not be sent and received by it. The deficiency was inherent in the principle of the machine. It can transmit electrical waves along a wire, under very favorable circumstances, not in the mode intended by the inventor, but one suggested by Bell's discovery, but it cannot transmute them into articulate sounds at the other end, because it is constructed on a false theory, and the delicacy of use required to make it perform part of the operation is fatal to its possible performance of the other part. A Bell receiver must be used to gather up the sound before the instrument can even now be adapted to a limited practical use. It was like those deaf and dumb pupils of Professor Bell, who could be taught to speak, but not to hear. That was all, but it was enough. A century of Reis would never have produced a speaking telephone by mere improvement in construction.

I am of opinion that the fifth claim of patent No. 174,465 is valid, and has been infringed.

The statute declares that if a patentee has claimed too much in any part of his patent he shall not recover costs, and it has been argued that certain claims of these patents, not relied on by the plaintiffs, are too broad. In this stage of the case the question of costs does not arise; but I may as well say, that there is not sufficient evidence in the record to enable me to find whether these claims are valid or not; and that the statute does not mean that claims not in issue should be contested for the mere purpose of settling the costs. More expense might be incurred in such a mode of trial than depended upon the main issue.

Decree for the complainants.

United States Circuit Court.—Western District of Pennsylvania.

GRADUATED GLASSWARE.—HOBBS *et al.* *vs.* KING *et al.*

1. Letters Patent No. 132,208, granted to J. H. Hobbs, October 15, 1872, for glassware graduated on its inner face, substantially in the manner set forth, examined, and sustained.

2. A patent for glassware graduated on its inner face is not anticipated by a prior patent for a graduated cup, "the graduations being in the interior if the cup be of metal, or blown or cut on its exterior if the cup be of glass." Such prior patent does not show or in the remotest degree suggest internal graduations upon glassware or any method of producing the same.

3. In Hobbs' (complainants') improvement the desired graduations are in the first instance made upon the face of the plunger, and thereby corresponding graduations are made in the glassware, while in the Block (defendants') plunger the edges of the rings form the graduations; but the principle of the two plungers is identical, their methods of operation practically alike, and the result substantially the same. The extension of the graduations entirely around the glass may have its advantage; but if it were conceded that such extension is a patentable improvement upon Hobbs' invention, still this would not justify the defendants in using his invention.

The Barb Fence Question.

A very interesting statement of the present aspects of the barb fence question, with a summary of the general results of the patent system in furthering the manufacturing and farming interests of the Northwest, has been published by the Washburn & Moen Manufacturing Company, of Worcester, Mass., and I. L. Elwood & Co., of De Kalb, Ill.

After showing the intimate dependence of the farming interests of the West upon local manufactures, and the influence of the patent system in securing the development of the latter, the authors present a cogent summary of the chief arguments in favor of encouraging invention in the way contemplated by the patent laws. Then they proceed to give some specially instructive facts with regard to fence patents, particularly those which have resulted in the development and perfection of the barb fence.

That the barb wire fence was an invention, they say, is amply shown by the fact that it is only a few seasons since it was a strongly challenged and somewhat strenuously resisted novelty. "Now having fully established its character and value before the world, there are those who are seeking to impress upon the farmers of the Northwest that such a statement as the following comprises its complete history: *Some one twisted a short bit of wire sharpened at both ends about another continuous wire or strand, and it proved to be just what the public wanted; and those who claim any patented specialties or proprietorship in the thing are robbers and extortioners.* But the history of barb wire is exactly that of other inventions. It had numerous inventors, reaching various stages beyond the first thought of annexing the barb. It had a comparatively ineffective start in life. It was not readily accepted as practical. It had to wait for recognized effectiveness for independent inventors and inventions to realize the perfect combination of the barb and the wire; and labor-saving machinery that could bring out the finished product cheaply. It cost several years of experiment, much outlay, much disappointment, and like all other promising inventions, waited for perfected utility until capital should take it up, advance the work, combine by purchase the various patents then in existence having reference to the same subject, and without which the original patent was comparatively inert and powerless, giving as the combined result a fencing material which is all the farmer desires, and all that those who brought together this great family of patents ever claimed for it: the cheapest, easiest built, and everywhere the most available fence material ever given to mankind.

"Thus, instead of arriving by a single feat of discovery, barb wire fencing has reached its present perfection through the protection of over *one hundred and eighty* patents and patented improvements, representing the various interests and rights of very many owners, expressly guaranteed to them by our patent laws as an exclusive right for a limited period."

The patents relating to the manufacture of barbed wire fencing, however, are but a small part of all the patents upon fencing materials and modes of construction. From 1801 to 1879 there were issued 1,229 patents for fences and fence materials, distributed as follows: New England States, 40; Middle States, 372; Southern States, 108; Western States, 696; District of Columbia, 8; Canada, 5. More than two-thirds of the fence patents have been issued since 1865, and, as the preceding figures show, the great majority of fence improvements have been made in the West, where stone and timber were absent or costly and the need of improved and more economical fencing has been most pressing.

The breadth and strength of the barb fencing industry is attested by a list of forty companies and individuals, representing large capital, and a capacity of 50,000 tons product annually, who are manufacturing under licenses. The manufacture of this fencing calls for a substantial plant of machinery and the best processes, and the opinion is expressed that not one of the firms named would undertake the business without some guarantee that their interests would be protected. The only royalty charged by the present owners of the patents is three-fourths of one cent a pound, the greater portion of which is turned over by them to the original patentees. The companies referred to (Washburn & Moen Manufacturing Company and I. L. Elwood & Co.) repeat in this pamphlet the announcement made some months ago, that no suit will be brought by them or either of them, nor will any demand be made, against any farmer who has purchased infringing barbed wire made by any unlicensed manufacturer previous to the court decisions of December last. They add:

"Not a single pound of barb fence can be sold, unless it is put upon the market at a price that makes it the cheapest fence material the farmer can use. That it rewards the inventors and is still the cheapest of fence materials constitutes the merit of the invention and the stimulation to other inventions. It is not a practical question, honestly to be considered by any fair-minded citizen, whether any man or organizations of men, who have no royalties to pay and no right to manufacture barb fence at all, can produce it cheaper."

The Question of Patents.

We understand that the Medical Society of the State of New York has appointed a committee to inquire into the matter of what changes, if any, are advisable in the code of ethics. From the make-up of the committee we do not doubt that its report will be founded upon sterling work, undertaken with the sole purpose of advancing the real interests of the profession, which, indeed, should be the only object

of a code of ethics, if we must have one. Should this anticipation prove true, the society may fairly be looked to to indorse the committee's recommendations, and, broached under such auspices, they may stand a chance of sober consideration by the American Medical Association. The committee is not likely to recommend radical changes unless it is made plain to them that such changes are approved of by a considerable portion of the profession. We trust, therefore, that those who have given thought to these matters may bring their views and conclusions to the committee's knowledge, either by publishing them or by direct correspondence with the committee.

For our part, we would urge upon the committee that it would be an act of propriety, as well as a matter of simple justice, to secure the abrogation of that portion of the code that proclaims it "derogatory to professional character . . . for a physician to hold a patent for any surgical instrument or medicine."

We do not propose to argue at length as to the propriety or impropriety of a physician's holding such a patent, for we think that the statement which we have quoted from the code would not have commended itself to physicians in general, nor have been suffered to remain so long a part of the code, had it not been bolstered up by being incorporated into the same sentence that declares it also derogatory "to dispense a secret nostrum." Whether this grouping of the two acts for common denunciation was an ingenious device on the part of those who abhorred the idea of a physician's holding a patent and who chose this way to spread their abhorrence, we are unable to say; but it is certain that the idea of dispensing secret nostrums is revolting to high-minded men, and, when they find this practice classed in the same category with the possession of a patent, it is no wonder that, without giving the matter much thought, they gradually come to look upon the latter as a heinous offense.

Very little reflection is needed, however, to show how diverse the two are, and how monstrous it is to class them together. The code has no denunciation for the holder of a copyright; and yet there is no essential difference between a copyright and a patent. A copyright covers a publication, and every one recognizes that about this there can be no secrecy; hence to couple the holding of a copyright with the dispensing of a secret nostrum would carry its own refutation. But a patent also is a publication—nothing of secret composition or of secret mechanism can be patented. Analogy shows us, then, that there is nothing in the nature of things to justify the assertion that it is derogatory to professional character for a physician to hold a patent. As a matter of fact, we find that some physicians do hold patents, and that they are not looked upon by their professional brethren as having debased themselves by so doing. We understand that Paquelin's cautery is patented. Whether the patent is held by the inventor or by the maker matters little, for, if now held by any other person than M. Paquelin, it must have been held by him originally. Who has whispered that M. Paquelin has degraded himself? Is an act right in France, but wrong in America? What, then, shall be said of Dr. Dawson, who patented a cautery battery of his invention? We have not heard that he has lost caste, and, for our part, we admire the independence he showed in acquiring and holding the patent right as much as we admire the ingenuity diplayed in the construction of the battery.

By declining to throw obloquy upon these gentlemen the profession has shown that it does not regard the possession of a patent as derogatory. That declaration in the code that so set it down is, therefore, a dead letter and ought to be expunged.—*N. Y. Medical Journal.*

Imitation Jewels.

The following are some of the very latest recipes for making imitation stones. Rue Turbigo, Paris, exhibits some paste jewels which even connoisseurs cannot readily distinguish from the real article, and must make use of scales or file to be satisfied whether they are handling a product of nature or of art.

The imitation of precious stones is to-day an interesting pursuit of chemistry, although in ages of antiquity Egypt and Greece had already attained in it a high perfection. All the precious stones, except opal, may be successfully imitated. The easiest of counterfeiting is the chrysoprase.

The coloring substances are the following oxides: Gold, for purple (*Purpura Cassia*); silver, for yellowish green; copper, for bright green; iron, for pale red; cobalt, for blue; tin, for white; manganese, in small quantity to make the glass devoid of color; in a larger, to give it an amethyst color; in great quantity, to make it black and opaque; antimony, for reddish hyacinth color.

To prepare the mass for the body proceed as follows: Pure flint or rock crystal is heated white, cooled in water, pulverized, and sifted with a silk sieve; thereupon exposed to the action of muriatic acid for several hours, washed, dried, and again sifted. Of this substance five different bases are prepared:

For the first base—1½ parts of the flint or rock crystal powder; 2½ white lead in scales; ½ saltpeter; ½ borax; ½ white arsenic.

For the second base—1 part prepared flint; 2½ white lead; ½ cream of tartar; ¼ calcined borax.

For the third—1 part prepared rock crystal; 2 red lead; ½ saltpeter; ½ cream of tartar; pulverize the mixture, melt it three times, and after every melting pour into cold water. This for the three preceding bases.

For the fourth—1 part prepared rock crystal; 3 calcined borax; 1 part cream of tartar; melt, pour the mass into lukewarm water, add an even amount of red lead (*minium*), and repeat the melting and cooling twice.

For the fifth base—Take 1 part prepared rock crystal and 3 cream of tartar, melt in a crucible, dissolve the mass in warm water, and add nitric acid as long as a boiling takes place; it is then carefully washed, dried, and 1½ parts white lead are added. To 1½ parts of this mixture add ⅛ calcined borax, next melt and pour into cold water. This makes, when ⅛ part saltpeter is added, a handsome crystal glass, which, without further addition, makes the artificial diamond, called Strass, from its inventor.

The following are recipes for imitations of precious stones:

For Yellow Diamond—16 ounces of fourth base; 24 grains horn silver; 10 grains antimony.

Sapphire—25 ounces of fifth base; 2 drachms 46 grains cobalt.

Oriental Ruby—1 ounce of fifth base, and a mixture of 2 drachms 48 grains purple of gold, and the same quantity of sulphuret of antimony and fusible manganese, and 2 ounces of rock crystal; *or*, 20 ounces of the flint base, ½ ounce fusible manganese, and 2 ounces rock crystal.

Balay Ruby—16 ounces of fifth base, and the preceding coloring substance, lessened by one-fourth; *or*, 20 ounces flint base, same coloring mass, but less manganese by one-fourth.

Oriental Topaz—24 ounces of first or third base; 5 drachms black antimony.

Brazilian Topaz—24 ounces of second or third base; 1 ounce 24 grains black antimony; 8 grains purpura cassia (purple of gold).

Saxonian Topaz—24 ounces of first or third base; 6 drachms black antimony.

Amethyst—24 ounces of fifth base; 4 drachms manganese; 4 grains purple of gold.

Emerald—15 ounces of any one base; 1 drachm blue carbonate of copper; 6 grains antimony; *or*, 1 ounce of second base; 20 black antimony; 4 grains cobalt.

Beryl—24 ounces of third base; 96 grains black antimony; 4 grains cobalt.

Common Opal—1 ounce of third base; 2 grains loadstone; 26 grains of some absorbing earth.

For the imitation of pearls, thin balls of glass are used, which by an addition of a small quantity of potash and oxide of lead, receive a bluish glittering sheen, and the inner sides of which are covered with the scales of a small river fish (*Cyprinus alburnus*). To make these scales pliable and adhesive, they are steeped for some time in spirits of ammonia in which a small amount of isinglass has been dissolved. Messrs. Savary & Mosbach exhibit some which, being solid, are in all respects equal to the Roman.

MISCELLANEOUS INVENTIONS.

THE DIVISION OF THE CIRCLE.—The problem, long ago practically abandoned by mathematicians as impossible, of dividing exactly, theoretically and mechanically, any angle into any number of parts, has at last been solved. A patent protecting the mechanical means used for this purpose was issued to O. P. Dexter, who has written a pamphlet ("The Division of Angles") fully explaining the mathematical theory of the subject, which, we understand, will be published at an early date by the American News Company of New York.

In the business of taking oysters from the bottom of the river or bay the dredge is hauled along the bottom by a rope or lever attached to the vessel, whose movement through the water supplies the power to drag the dredge. Now, this business places the operators in great danger of life and limb, due to a violent backward motion of the crank in case the dredge should strike a "hang" or a large stone or other obstruction on the bed of the river or bay. Mr. John S. Stuart, of Crisfield, Md., has patented a simple and efficient form of dredge winder which obviates this danger. It consists in recessing the end of the spool and providing it with a circular series of inwardly-projecting ratchet teeth, then fixing rigidly on the shaft at the end of the spool a disk, and outside of this a loose ratchet wheel and pawl with right-angular dogs acting through the stationary disk from the loose ratchet wheel upon the spool, so that the spool may be wound up or automatically released when an extraordinary strain is put upon the rope.

An improved apparatus for transmitting motion has been patented by Mr. Stephen Dennis and Antonio Samper, of Paris, France. This invention relates to improvements on the invention the subject of former Letters Patent dated 16th July, 1879, for mechanism for the transmission of motion by means of bands, ropes, or chains wound spirally on drums or surfaces receiving rotary motion.

An improved pen holder has been patented by Mr. Daniel Hepp, of Chicago, Ill. The object of this invention is to enable several parallel lines to be drawn at one stroke of the pen. It consists in connecting two pen holders to one staff, and securing them together by set-screws, so that they can be easily and quickly adjusted to enable the pens to draw several parallel lines.

Mr. William Von Bergen, of Andover, Mass., has patented an apparatus that can be used at will either as a photographic camera or as a magic lantern, thereby saving the expense of two instruments.

An improvement in fences has been patented by Mr. James A. Manning, of Danville, Ind. The object of this invention is to facilitate the construction of fences and increase their strength and durability.

Mr. Joseph T. Hammick, of Rhinebeck, N. Y., has patented an improved car coupling and detaching device, by means of which cars may be coupled and uncoupled without going between them by using the ordinary link, either straight or crooked.

An improved fire escape has been patented by Messrs. Alfred J. Harrison, Alexander H. Birkmire, and Frederick Lowe, of Parkville, Conn. This invention relates to that class of devices that are designed to be operated from the street for affording means of escape to inmates of burning houses, and it consists of the combination with screw-actuated lazy-tongs of hinged sliding supporting blocks, whereby the tongs may be inclined toward a building, and of devices for holding them in that position; and it consists, further, in combination with the adjustable tongs and supporting blocks, of a rope ladder and a flexible tubular conductor for affording direct means of ascent and descent.

An improved handle socket for shovels, spades, and scoops has been patented by Mr. Patrick W. Groom, of St. Louis, Mo. The invention consists in a socket provided with a flange having recesses in its under surface around the rivet holes, so that the lower heads of the rivets and that part of the sheet iron of the shovel or scoop covered by these rivet heads will be driven into these recesses, whereby the heads of the rivets will become flush with the under surface of the shovel, and consequently will not wear off as rapidly as they do in the shovels of ordinary construction.

The New Cunard Liner Servia.

While this splendid new vessel, to ply between New York and Liverpool, built by Messrs. Thomson, of Clydebank, was proceeding down the Clyde a few days ago, with the object of having her experimental trials made, it was observed that a crack was opening out in the main crank shaft. Although it might have been possible to work the vessel for some time with the imperfect shaft, yet it has been deemed advisable to have it taken out and either thoroughly repaired or a new one substituted. The work will, it is expected, occupy about two months. The shaft was made at the Lancefield Forge, Glasgow, and is probably the largest hitherto placed in any Clyde-built steamer. Along with the above fact a very remarkable circumstance transpired, namely, the existence of a flaw in the corresponding portion of the spare shaft, which was made at the Mersey Iron and Steel Forge, Birkenhead. A new shaft has since been ordered, and no fewer than four furnaces will be at work on as many separate forgings for making a "built" shaft, the crank pin of which is to be of steel. The Servia is a vessel of 8,500 tons, 530 feet in length, and the largest merchant vessel yet built, with the exception of the City of Rome, recently launched at Barrow-in-Furness, excluding the Great Eastern.

An English Opinion of American Locomotives.

R. M. Brereton, an English engineer, says concerning American locomotives: "I argue that the greater duty done by the American motor is due to the better design and better system of working the locomotives. The American builder excels in the system of framing and counterbalancing, and in designs of crank axles, etc., so that the engine may run remarkably easy and without jar round sharp curves, and work not only on the light roads, but also diminish the wear and tear on the solid roads, and at the same time increase the effective tractive force. The English engine is a very heavy affair, and in running it not only wears and tears itself very rapidly, but also the roadway, and by its unsteadiness and jar it greatly fatigues the drivers and firemen. I have ridden hundreds of miles on engines in India, in France, and in the United States, and have always found the American engine most easy and comfortable; but I never did the English or the Continental engines. It is almost impossible to give these engines their full hauling power, simply because the greater portion of the weight cannot be thrown on the driving wheels."

Trial of the Largest Dredger in the World.

The new iron hopper dredger recently constructed by Messrs. W. Simons & Co., Renfrew, for Otago, was lately tried on the Clyde, and dredged at the rate of 400 tons per hour, which was plunged into its own hold or hopper cavity, capable of containing 1,300 tons of spoil. At the same time it loaded with several hundred tons the new government steamer Perseverance, which came alongside. Afterwards, by steam appliances, its bucket girder was elevated, and its twin screw propellers put in motion, and the vessel steamed away down the Clyde to the measured mile, where the loaded speed was tested at 7½ knots per hour; the vessel then steamed down the Firth of Clyde, where its large cargo was instantly deposited through its bottom in 60 fathoms water.

This vessel dredges from 5 feet to 35 feet depth, has twin screws, and is propelled and worked by two independent sets of compound engines of 700 horse power, and besides loading its own cargo, it can fill if required a fleet of barges on the old system. It is the property of the Otago Harbor Board, and will steam to New Zealand.

The trial of dredging, steaming, maneuvering, and depositing was considered very satisfactory; this being the tenth and largest hopper dredger constructed by Messrs. Simons & Co., who are the inventors and originators of the system. It is also worthy of note that, owing to the enterprise of the above small colony, they will have a dredger the equal of which is neither in Europe nor America.

Business and Personal.

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

NEW BOOKS AND PUBLICATIONS.

UEBER DAS TECHNISCHE SCHUL UND VEREINSWESEN FRANKREICHS. VON WILHELM VON NORDLING. Wien, Pest Leipzig: A. Hartleben. 1881. 54 pp. (Technical Schools and Societies in France.)

The author gives a brief description of the origin and growth of the several institutions for technical education in France, their average attendance, course of study, and the several societies of the former scholars of these institutions. Among the schools and colleges mentioned are: the Ecole polytechnique, Ecole des Mines, Ecole des Ponts et Chaussees, Ecole des Arts et Metiers, Ecole des Arts et Manufactures, and several others. From this work it will be seen that there are 13 technical societies, with 17,000 members, in France.

PARIS UNIVERSAL EXPOSITION OF 1878. Reports of the United States Commission. Washington: U. S. Government Printing Office. 5 vols. 8vo. Illustrated. 1880.

The several volumes of these reports comprise: (1) Report of Commissioner-General R. C. McCormick, with accompanying papers, including lists of exhibitors and awards. (2) Report of Commissioners William W. Story (Fine Arts); Joshua L. Chamberlain (Education); Andrew D. White (Political Education); Elliot C. Jewett (Manual Training Schools); John T. Norton (Wood Carving); Henry Howard (Textile Fabrics). (3) Daniel J. Morrell (Iron and Steel); William P. Blake (Ceramics and Glass and Glassware); F. P. Baker (Forestry); P. M. B. Young (Cotton Cultivation). (4) Thos. E. Jenkins (Chemical Processes); James D. Hague (Mining Industries); A. J. Sweeney (Steam and Gas Engines); William T. Porter (Machines and Machine Tools); Edward H. Knight (Clocks and Watches); William J. Anderson (Railway Apparatus). (5) Edward H. Knight (Agricultural Implements); John J. Woodman (Agricultural Products); Samuel Dysart (Live Stock); George W. Campbell (Horticulture); Thomas B. Ferguson (Pisciculture). The several reports are illustrated with engravings and charts, some of them profusely, and the several volumes are well indexed. That they contain a vast store of practical information and suggestion goes without telling. To a great extent the information here given was set before the public in our newspapers and technical journals during the holding of the exhibition; but it is well worth preserving in this more compact and accessible form. For the set of reports on our table our thanks are due to Commissioner E. H. Knight.

HYGIENE AND TREATMENT OF CATARRH. By Thos. F. Rumbold, M.D. Part II. St. Louis: George O. Rumbold & Co.

Our favorable opinion of the first part of Dr. Rumbold's work, treating of the hygiene of catarrh, was expressed some months ago. The second part is devoted to therapeutic and operative measures for chronic catarrhal inflammation of the nose, throat, and ears. The work is plainly written, and illustrated by forty engravings of anatomical structures, apparatus, operations, etc. Thoughout the author insists on the paramount importance of hygienic measures and the advantage of non-irritating remedies and mild methods of treatment.

HAND-BOOK OF USEFUL TABLES FOR THE LUMBERMAN, FARMER, AND MECHANIC. Ithaca, N. Y.: Finch & Apgar. 25 cents.

A handy little book, especially for the lumberman. The numerous tables are the work of a graduate of Cornell University and presumably accurate.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) H. M. G. asks: 1. Where can I obtain lead foil for making a secondary battery? A. Any maker of tin foil can roll it for you. 2. Who first invented the link motion of the locomotive? A. Robert Stephenson is generally credited with it, as he introduced it in 1843; but a Mr. Howe, one of his employes, is said to have invented it in 1842.

(2) H. E. K. writes: My cistern water does not smell pure, owing undoubtedly, to the top being tightly closed and the only air reaching the water being through the filling and overflow pipes. I have raised the lid now so that it can have air. Is there anything I can put into the water to purify it, or will it purify itself by contact with what air reaches it through an opening at the lid 1 foot by 3 feet? A. Put into the water a few bushels of freshly burned charcoal in granular powder (free from fine dust). Stir up the water and let it settle. If this does not remedy the evil it is better to clean out the cistern. Surface contact with air will be of little use.

(3) M. W. C. asks: 1. Are the black rubber combs so much in use injurious to the hair or beard? I have somewhere read so. A. We think not. 2. Does the decomposition of white rubber corks by nitric acid render the latter unfit for use as a caustic? A. Yes; nitric acid should always be kept in glass stoppered bottles.

(4) C. W. W. asks: Can you furnish me with any information in regard to cleaning stone work (cut) in front of buildings? Is there any process, and where and how can it be obtained? A. Use short, stiff wire scratch brushes, and a dressing hammer, if necessary, with plenty of water. If the stone is granite, traprock, or sandstone, dilute muriatic or sulphuric acid may prove useful; but it is better to do without them if possible.

(5) N. R. B. asks: Are there any nickel mines now worked in the United States? How is it taken from the ore: by smelting or by chemicals? I send you a specimen of mineral, marked as above, found here in large quantities. Please inform me what it is through your columns. A. There are several nickel mines in the United States. The metal is usually obtained from the ore by solution and precipitation, and is finally reduced in a furnace. Consult Percy's Metallurgy. The minerals are noticed under appropriate heading.

(6) W. K. P. asks for a plain and not expensive mode of bleaching wax; but the bees feed nearly exclusively here on vine and fruit, which, according to my experience, makes a difference in the process. A. One of the best methods of bleaching beeswax is that of exposure to sunlight under glass. The wax is cut in very fine shavings, and spread out so that all parts of it are acted upon alike. Another good method is to melt the wax and stir it about for some time with a mixture of fine granular charcoal (free from dust) and bisulphite of lime—1 of sulphite, 3 of charcoal, and 30 of wax. The charcoal and salt are separated by straining.

(7) H. C. asks: What is best for making a waterproof joint on a flagstone sidewalk? Stones are all iron matched. Is lead good? A. Lead does very well. Pack the lower part of the joint with oakum.

(8) D. W. O. asks: What materials are used in the preparation of cement or asphaltum for walks? What should be their condition, their proportion, and the best manner of laying? A. See Footwalk Pavements, SUPPLEMENT, No. 83, and Street Pavements and Sidewalks, SUPPLEMENT, No. 33.

(9) E. S. writes: I wish to separate the pulp of cooked apples from the rinds and cores. It can be thrown out by putting them in a perforated cylinder. Please let me know which you think would be best: a perpendicular or horizontal motion. Would not there be less danger of it clogging if the motion was irregular? How many revolutions ought it have per minute? A. You might use with advantage for this purpose a centrifugal machine. The horizontal is preferable to the perpendicular motion. The motion should be as regular as possible. Such machines are usually run at from 500 to 1,000 revolutions per minute.

(10) H. P. H. asks: 1. Is the dirt or any foreign substance in water taken up in the steam to any appreciable extent? A. Yes, if dirty water be used, containing much vegetable matter. 3. Can you give me the ratio of speed to power required? For instance, if I run an emery wheel, 18x3, 500 revolutions per minute, how much more power will it take to run it 1,000 revolutions? A. It depends upon the kind of work you wish to do on the wheel. It could not be determined except by direct experiment.

(11) W. L. D. and W. T. T., who ask about a process for producing a large number of copies of manuscripts, etc., by the gelatin process, are referred to article on Stencil Copying Process, page 65, current volume.

(12) I. M. asks how to render wood waterproof. A composition not containing alum would be preferable. A. Dry and saturate the wood as far as possible with hot paraffine oil or melted paraffine.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

S. A.—The clay contains too much iron and sand for porcelain or white ware. It might make good bricks.—J. McF.—The rock is trap. The brassy crystals are pyrite—sulphide of iron; the white crystals calcite—lime carbonate.—F. E. C., Jr.—The red stone is jasper; the white is quartz. The ore marked B would require an assay to determine its value.—E. W. W.—The limestone contains a small quantity of galena—lead sulphide—hardly rich enough to work profitably. The lead probably carries a trace of silver.—B. B. P.—The supposed sulphur is pine pollen.—T. R.—1. Sandstone with a small quantity of lignite—not black lead. It is of little practical value. 2. Fossiliferous limestone. 3. Argillaceous limestone. 4. Missing.—G. M. M.—1. Arsenical sulphide of iron. 2. Mica schist. 3. A micaceous sand containing a little sulphide of iron. 4. The rock contains a small quantity of chalcopyrite.—E. P.—The pebble is a fragment of clear quartz, with a little free gold adhering to it—rich ore.—H. J. C.—A piece of coal shale.—J. S. R.—1. Sulphide of iron with a little galena—lead sulphide. Probably argentiferous. 2. Copper and iron sulphides. 3. Quartz and pyrrhotine—magnetic iron pyrites—probably contains traces of nickel. 5. Altered ferruginous feldspathic quartz—possibly slightly auriferous. 4. Chalcopyrite—copper iron sulphide. 6. Chiefly sulphide and phosphate of copper and sulphide of iron.—J. W. M.—Quartz and feldspar containing much graphite. If the sample correctly represents a large body of rock the property is valuable.—A. B. B.—No. 1. Gypsum—used for making plaster—(plaster of Paris). Nos. 2 and 4. Silicious lime carbonate. 3. A ferruginous clay—could be used for making bricks and cheap pottery.—J. C.—1. Silicious and ferruginous limestone. 2. Limestone containing traces of copper and iron sulphides.—N. G. & Co.—Galena—sulphide of lead—a valuable lead ore. It probably contains a trace of silver.

COMMUNICATIONS RECEIVED.

On a Celestial Phenomenon. By H. P. B.
On Brilliant Parhelia. By S. G. I.
On the Ring-Necked Snake. By C. F. S.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

July 26, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Animal shears, N. L. King 244,810
Apple and grape crusher, etc., G. L. Wenzel 244,961
Axle lubricator, J. R. Anderson 244,782
Bag holder and weigher, grain, J. J. Dunan 244,868
Bag machine, W. C. Cross 244,861
Baling press, A. S. Robinson 244,922
Ball trap, C. B. Holden 244,897
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Barrel platform, swinging, W. F. Veber 244,836
Battery. See Galvanic battery.
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Bicycle, W. Rennyson 244,961
Bolt clipper, A. Breth 244,789
Boring machine, Hammond & Holman 244,749
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Bottle stopper, W. F. Wade 244,966
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Caoutchouc with hydrocarbon oils, treating, L. Beckers 244,788
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Car, dumping, M. Van Wormer 244,954
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Chair. See Folding chair. Window cleaning chair. Tilting chair.
Chair seat, J. Rowe, Jr 244,769
Churn, J. G. Munroe 244,920
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Cloth shearing machines, attachment for, D. McColl 244,817
Clothes drier, R. W. Trude 244,835
Clothes, washer, S. Rea 244,930
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Corset, D. H. Fanning 244,744
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Crank or wrist pin, A. W. Wolf 244,780
Crusher. See Apple and grape crusher.
Cultivator, P. Sinnhold 244,773
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Fanning mill and separator, C., N., & N. Altringer, Jr. 244,727
Fare box, J. H. Small. 244,774
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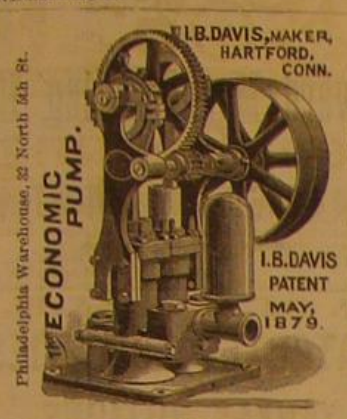

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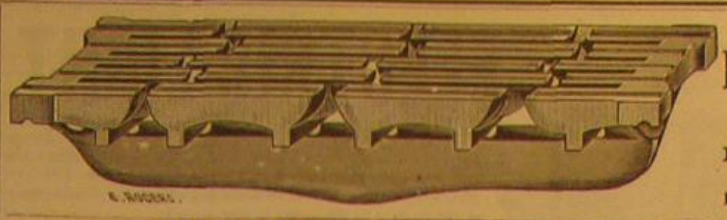

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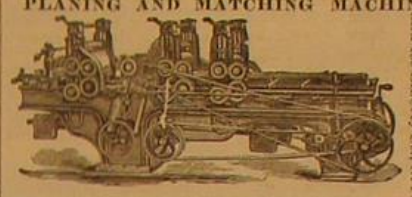
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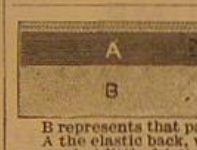

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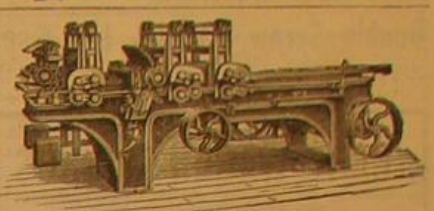
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