SCIENTIFIC AMERICAN

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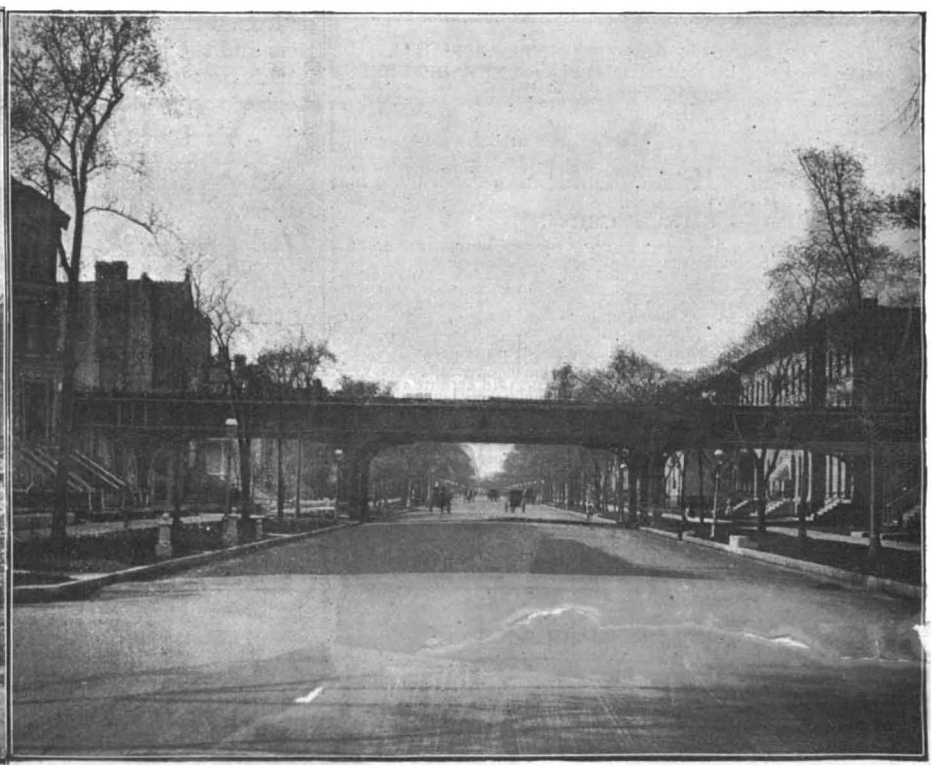

Moving the Normandie Flats. Progress of building operations. The road crossing a street.

THE WEST SIDE METROPOLITAN ELEVATED RAILROAD OF CHICAGO.—[See pa

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NEW YORK, SATURDAY, APRIL 27, 1895.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1008.

For the Week Ending April 27, 1895.

Price 10 cents. For sale by all newsdealers.

PETROLEUM, THE GREAT ILLUMINANT.

The advanced political economist and student of social economy has selected among the exponents of the civilization of mankind two salient industries. The old assertion, that the nation is the most civilized which manufactures the most soap, is far from being a mere hint at the beauties of cleanliness. The real meaning of the assertion is that in the manufacture of soap there is involved an enormous bulk of chemical processes. Sulphuric acid works produce the acid with which salt is treated in the first step of the soda ash process, and sulphuric acid works present almost or quite the greatest development of modern chemical industry.

The salt itself has to be produced either from mines or from brine, while the mining of sulphur and pyrites and the production of nitric acid are all involved in this first step of the soda ash process. The next steps of the process produce the carbonate, but soap is as yet far off. In its production are joined the tallow manufacturer, the producer of the various vegetable oils, the resin manufacturer, and the lime burner. The country that manufactures the most soap is the one that puts these and other chemical and mining industries to the greatest possible use.

Artificial light is another of the great developments of the day which is accepted as an exponent of the progress of civilization. In olden times, when it was said that a manuscript smelt of the midnight oil, it indicated the fact that the chimneyless lamps of 2,000 years ago produced an odor. The candles of old times required snuffing every ten minutes to dispose of the unconsumed carbonaceous residue of the wick. For thousands of years nothing short of a torch or a bonfire was known that would give a reasonably strong light. So great were the difficulties of producing satisfactory illumination, that what would seem to-day almost trivial inventions were really very great ones. The Argand lamp, with the central draught, and the self-snuffing candle, with wick plated and dipped in borax solution, really represent important improvements.

Burning springs have long been noted as one of the curiosities of nature. It is now more than thirty years ago since the burning springs received their logical development in the establishing of the great petroleum industry, when the oil regions of Pennsylvania began to overflow with mineral oil. The next development was the production of natural gas, and the latter for a while figured as the grandest pyrotechnic of nature. There were not wanting prophets who said that this astonishing manifestation of the powers of nature would cease sooner or later, and already the natural gas supply of the country is diminishing.

Within the last few weeks the price of petroleum, the congener of natural gas, has rapidly risen, which may be taken as indicating a diminution of the supply. Those who live in large cities where the light of gas, itself a recent invention, has been superseded by the electric light; where the streets lighted by the arc lamp are almost as brilliant by night as by day, may feel little concerned in the price of kerosene oil; but throughout the land, far and wide, every farmhouse is lighted by kerosene. Many villages are entirely dependent upon it for their light, and any curtailment thereof is to be regarded as a retrograde step in the march of civilization.

To the traveler abroad one of the most homelike sights are the great piles of blue oil barrels, indicating America's supply of artificial light to the world. On this same supply of petroleum is based one of the greatest business organizations of the country, one which has had the greatest influence on the affairs of the land from the business, social and even educational standpoint. Should the supply of oil from American territory cease, the country would be most profoundly affected from almost every standpoint.

It is to be hoped that, inspired by the idea of giving a reasonable price to their product, the well diggers will succeed in their quest for new oil rock and for new oil territory. It seems as if it were within the possibilities that we might become importers of oil from Russia and the Caspian regions, while hitherto we have exported the refined products by the shipload. In spite of the electric light and of gas light, kerosene remains to-day the great light of the people, and its adaptability to the humblest farmhouse would make its curtailment a national calamity.

Waterproofing Brick.

At a recent meeting of the Australian Association for the Advancement of Science, Professor Liversidge read a paper on the "Waterproofing of Brick and Sandstone with Oils." These experiments were made with the view of ascertaining the length of time that brick and sandstone are rendered waterproof or protected by oiling. The oils used were the three commonest and most readily obtainable for such purposes, namely, linseed oil, boiled linseed and the crude mineral oil known as "blue oil" used for preserving timber. The weatherings were made upon a flat portion of the laboratory roof fairly exposed to the sun and weather. Good, sound, machine made bricks were experimented on. The amount of oil and water taken up by the sandstone was very much less than that absorbed by the brick, although the area of the sandstone cubes was much greater than that exposed by the bricks. Equal amounts of the raw and boiled oils were absorbed; the blue oil, however, was taken up in much greater quantity by both brick and sandstone, but by the end of twelve months the whole of the 13½ ounces of blue oil had apparently evaporated away, and the brick had returned to its original weight, but those treated with raw and boiled oils remain unchanged. After the second oiling in November, 1890, and exposure for nearly four years and two months, they had practically retained all their oil, inasmuch as they had not lost weight and were also practically impervious to water. It was noticeable that the sandstone cubes treated with raw and boiled oils returned to their original weights, but do not appear to have lost the beneficial effects of the oils, being practically impervious to water.

Car Fenders.

There is something to be said in behalf of the trolley road and cable road companies. After experience had demonstrated the need of some safety appliance, most of the companies experimented with various contrivances, and nearly every company adopted some device, presumably the one that seemed to promise the best results in view of the style of cars used by the company and the character of its track. Many of these contrivances have proved to be so much worse than useless that they have come to be known collectively as the murderous car fender. The companies do not want to substitute other patterns of murderous car fenders for the ones in use, nor does the public wish to see this done.

The various fenders in use and the multitude in the Patent Office that will never be used indicate that most of the inventors have no conception of the difference between a trolley car gliding slowly on a perfect track and a trolley car rocking along at the top limit of speed over the average track of Brooklyn, for instance. There are many fenders that under the first named conditions would seat a careless citizen so comfortably in their luxurious meshes that it would seem a pity that their inventors had not added the necessary appliances for handing him a morning paper and putting a lighted cigar in his mouth; yet these same fenders in actual use would knock down the citizen, hold him down despite his struggle for life, bruise and disable him, and, when he was no longer able to resist, would pass him along for the drawbar, brake rods, wheel guards, wheels, and power box to complete the job. The managers of the companies do not want any more of these fenders.

It is probable that some one of the machinists of the trolley or cable companies, or some outside inventor, will see the necessity of departing from the principle of most of the fenders in use, which are grievous sinners, and of producing something entirely different. The incentive is ample; for nearly all of the trolley and cable roads are equipped with comparatively new cars, which they could not afford to discard at once, even if some inventor stood ready with the car of the future, all designed and built for safety from the wheel flanges up. We should say that the successful safety appliance for use until the present cars are discarded should be, first of all, not a murderous fender. It should pick up persons, large or small, whom it might encounter prone on the track and should trip persons overtaken on foot so that they would fall on top of the safety appliance and not beneath it. It should carry along, not necessarily on a feather bed, until the car could be stopped, such persons as it might pick up or trip up, or should dump them aside out of the way of the body or truck of the car. It should protect them from mangling by the projections beneath the platforms, as well as from death under the wheels. It should do this on any track smooth enough for cars to be run regularly over it, and with any possible distribution of the load in the car. It should be easily applied to any car, so that the companies would not be subjected to the cost and the public to the delay of traffic consequent upon laying up cars for a considerable period for alterations necessary before attaching the safety device. It should be reasonably cheap.

We believe that devices which should meet these requirements would be welcomed by the trolley and cable companies, and would be adopted without unnecessary delay. It is not too much to hope that they will be forthcoming before long, and it would be better to wait for them a little longer than to force the companies to substitute other murderous fenders for those now in use.

Meanwhile, it would be well for the parents of Brooklyn and elsewhere to prevail upon their children to quit the practice of darting on to the track in front of a car, standing between the rails and twirling their fingers before their noses at the anxious, almost unnerved motorman until he brings the car nearly to a standstill. A switch applied properly to the body of a youngster inclined to court collisions with street cars would be a useful car fender.—New York Sun.

American Shoe Machinery in England.

There has recently been one of the most prolonged and extensive "strikes" ever known in the boot and shoe industry in England. The Shoe and Leather Reporter states on "unquestionable authority" that there were fully 200,000 operatives out of work early in April, and it is said that large quantities of American shoes have been ordered for the English market, consisting mainly of welted boots and shoes, a class of work which English manufacturers cannot compete with in consequence of the high costs of production there.

Comparing the relative cost of production in America and in England, a London paper says: "We have on view at this office a pair of gentlemen's high class Goodyear welted boots made by a tiptop New York house. Nothing better in either workmanship or material could be produced in Northampton, though the style is hardly right for the English market. The labor cost of making and finishing this boot in America works out as follows, and it is important to remember that at the rates quoted, the American workmen make a minimum of £3 a week, running up to £4 10s. in many cases, and higher in exceptional cases, each man working single handed and in factory hours:

How Paid.		Cents per Pair.
Piece work	Lasting machine operator	3
"	Pulling upper over last	3
"	Tuck pulling and bracing toe	1
Day work	Sewing welt	1¾
Piece work	Welt beating	⅔
"	Repairing	2
"	Filling bottom	2
"	Sole laving and rounding seat	2
"	Rounding and channeling	1¼
"	Stitching	3
"	Leveling	2
"	Sprigging seat	½
Day work	Slugging top piece	½
Piece work	Heel attaching	1¼
Day work	Breasting heel	⅓
Piece work	Trimming heel	1½
"	Trimming edge	2
"	Pricking stitches	1
"	Burnishing edge	2¾
"	Scouring heels	1-6
Day work	Burnishing heels	¾
Piece work	Seat wheel	1
Day work	Inking shank and top piece	¼
Piece work	Finishing shank and top piece	1½
"	Finishing bottom	2
"	Beading edge and top piece	¾
Day work	Rubbing off / Pulling lasts	¾
Total (say 1s. 7½d.)		38⅔

"The total labor cost of this boot throughout in New York (a more expensive city to live in than London) is a trifle under 3s. 2d., and the boot sells to the trade at 17s. 6d., so that the wages bill comes out at about 18 per cent all told—a veritable triumph of manufacturing. There is not a manufacturer in Northampton who would not be delighted to pay higher wages than are shown in the above costing, and yet the costing as it stands gives the men about double the wages they earn in this country! How is it? Just this, that Englishmen will not work the machines to their proper capacity. The old-fashioned fallacy has been drilled into them that the more boots can be made to cost, the better it will be for trade, and the less work done by each man, the more there will be to go round. It seems incredible, but it is nevertheless true, that the employers who use machinery are prepared to double the present earnings of their men, provided the latter will only work at the same speed as their American brethren of the craft. But they won't do it, and when they are only asked to work at half speed they consider they are being used as 'pacemakers.'"

The English workmen have hindered the introduction of many machines that are in common use in this country, and for that reason better shoes, more stylish, light and "dressy," are made here and at considerably less cost than in England. The Goodyear sole sewing machine has been generally introduced. It is proved that the welted shoes made by it are better than those made by hand. They are, of course, much cheaper. Then the team work in American factories is an advantage, and there are many little mechanical contrivances in use which the workman strenuously objects to. It has been known to a few persons for some time, and now the people of two continents have learned on English authority that though "the prices paid in England to operatives are in many cases double those in the United States," yet shoes "can be freighted across the Atlantic and sold in England for less than shoes of the same quality can be made there."

Crystallized Carbon Dioxide.

Prof. A. Liversidge says: When solid carbon dioxide is examined under the microscope, it presents along its edges projecting wire-like crystals, which have branching filaments issuing from them apparently at right angles, resembling somewhat the groups of minute crystals seen in crystallized iron, gold, and ammonium chloride. The rapidity with which the carbon dioxide evaporates makes it difficult to catch the form of the crystals, either by photography or other means.

The Use of Steam Pilot Boats.

The Sandy Hook pilots of New York and New Jersey have for some time been in favor of using steam for pilot boats, and the recent meeting of the Pilot Commissioners in New York has served to call forth some very interesting arguments in favor of the innovation. It is claimed that four large sized steam pilot boats will be able to do the work of the twenty-one boats of the New York pilots and eight boats of the New Jersey pilots which are at present in use. These boats would have to be at least 130 feet in length, of high speed and worthy to rank with the best class of private steam yachts. The advantages of such boats over the pilot boats now in use are obviously very great. During heavy fogs they would be able to find a vessel and guide it by signals. They could take off the pilots from outward-bound vessels in any weather and there would be no more cases of pilots being blown across the ocean by heavy storms. The ice would not prove so troublesome to a steam vessel as it does to the present pilot boat. It is thought that the steam boats could run up so close to a vessel in heavy weather as to board her, no matter how severe a storm raged. The advocates of steam pilot boats also contend that the distressing accidents and loss of life on pilot boats during the recent blizzard could not occur to steam pilot boats. It is thought probable that the steam pilot boats will be introduced in the near future. The fifty-six New Jersey pilots are all in favor of the plan. There is still some opposition among the one hundred and eleven New York pilots, but the friends of the movement expect to overcome all objections.

Railroad Telegraphers' Law.

On this subject the Railroad Gazette expresses the following views:

The proposition to regulate the employment of railroad telegraph operators by law, which has been presented in a number of State legislatures within the last year or two, has now appeared in New York, Representative Audett, of Brooklyn, having presented a bill making it a misdemeanor to employ any person under 18 years old to send or receive train orders unless he has had a year's experience at telegraphing. This is not exactly the same as telling a boy that he shall not go near the water until after he has learned to swim, but the wording of the bill suggests that kind of a regulation. This is a matter which cannot be regulated by a hard and fast rule fixed in statutory form. Probably nine-tenths of the fatal blunders due to inexperience or lack of training have been made by persons over 18 years old; that is, persons who have both the age and the experience prescribed in this bill. Experience in telegraphing alone is but a single item, and it is not a decisive qualification, because so many operators with even two or five years' experience are yet poor operators. The age qualification means experience in the whole field of life; but this, again, is of indefinite value. The essential demand is for a person who has had experience and training in the line of work he is to do; sending and receiving messages, delivering them to conductors, holding trains, and the whole procedure specified in rules 500–527 of the American Railway Association. A law stipulating experience should specify where or under what kind of a tutor; but how can the legislature of New York or of any other State do this? If there were a school of train dispatching, with the author of "The Train Wire" at its head, some good might be effected by means of diplomas, but as long as there is not such a school, and no systematic discussion has been had by qualified persons as to the minimum of ability that could safely be tolerated, the legislature can only work in the dark. A crude law like Mr. Audett's, only scratching the surface, helps to inspire disrespect for all laws, as it is so poorly adapted to the problem in hand that it will not be thought of three months after its passage. If there are incompetent operators in the service of New York railroads, the railroad commissioners ought to inquire into the subject and report the actual facts of the situation.

The most prominent defect in the training of telegraph operators for railroad service is the loose way of bringing the teachers and learners together. A beginner generally learns to telegraph from a second-class operator, learns the other important duties of his position—how to manage his signal and how to deal with trainmen—from a second-class station agent, perhaps, and for the finishing touches—touches to make up for the deficiencies of these teachers—dependence is placed either upon the division operator or the dispatcher, communicating chiefly by wire, or upon the learner's native ability. The highest grade teacher comes into personal contact with the pupil very little, if at all. A few weeks in the office with a first-class dispatcher is worth more to most pupils than a year at a small office with the average operator. We know of roads on which a reform in this feature would produce an improvement in the service; but publicity at the hands of the railroad commission is the only instrumentality that the State can apply at present with any hope of useful results. A specific statute would run against a snag in trying to designate the suitable dispatchers for instructors. A speaker at a recent meeting of the Central Association of Railroad Officers brought out an important point in connection with the personnel of the telegraph service, to wit, that operators handle all sorts of communications between the officers of a road, and are therefore in the position of confidential secretaries; and, consequently, that the moral character of all applicants should be particularly looked into. It has been the boast of the telegraph service of America that thousands of operators, working for small pay and under no bonds or any very impressive pledge, have faithfully kept the secrets of telegrams, with exceedingly rare exceptions; but this is no warrant for neglecting all reasonable measures to keep this standard from being lowered. Moreover, the superintendent who looks sharply to moral character is pretty sure to find all his problems of discipline much easier to deal with.

Great Gold Nuggets.

A correspondent of the Mining and Scientific Press says the largest piece of gold, free of quartz, in the world was taken from the Byer & Haltman gold mining claim, Hill End, New South Wales, Australia, on May 10, 1872, its weight being 640 pounds; height, four feet nine inches; width, three feet two inches; average thickness, four inches, and was worth $148,800. It was found embedded in a thick wall of blue slate, at a depth of 250 feet from the surface. The owners of the mine were living on charity when they found it.

The Welcome Stranger nugget was found on Mount Moliagel, February 9, 1869; it weighed 190 pounds and was valued at $45,000. It was raffled for $46,000.

The Welcome nugget was found at Bakery Hill, June 9, 1859; it weighed 184 pounds 9 ounces 16 pennyweights, and was worth $44,356. It was raffled for $50,000.

The Lady Hotham nugget was found in New South Wales, Canadian Gully, September 8, 1854; it weighed 98 pounds 10 ounces 12 pennyweights, and was sold for $23,557.

The Union Jack nugget was found February 28, 1857; it weighed 23 pounds 5 ounces, and was sold for $5,620.

No name nugget was found at Eureka, Dauttons Flat, February 7, 1874, at a depth of thirty feet from the surface; it weighed 52 pounds 1 ounce, and was sold for $12,500.

The Leg of Mutton nugget was found at Ballarat, January 31, 1853, at a depth of 65 feet; it weighed 134 pounds 11 ounces, and was sold at the bank for $32,380. This nugget was shaped like a leg of mutton, hence its name.

No name nugget was found at Bakery Hill, Ballarat, March 6, 1855, near the surface; it weighed 47 pounds 7 ounces, and was sold for $11,420.

No name nugget was found in Canadian Gully, Ballarat, January 22, 1853, near the surface; it weighed 84 pounds 3 ounces 15 pennyweights, and was sold for $20,235.

The Kohinoor nugget was found at Ballarat, July 27, 1860, at a depth of 160 feet; it weighed 69 pounds and was sold for $16,686.

The Sir Dominic Daly nugget was found February 27, 1862; it weighed 26 pounds, and was sold for $6,240.

No name nugget was found at Ballarat, February 28, 1855; it weighed 30 pounds 11 ounces 2 pennyweights, and was sold for $7,395.

No name nugget was found August 1, 1879; it weighed 12 pounds, and was worth $2,280.

No name nugget was found at Ballarat, February 3, 1853; it weighed 30 pounds, and was sold for $7,360.

No name nugget was found in Canadian Gully, January 20, 1853; it weighed 93 pounds 1 ounce 11 pennyweights, and was sold for $22,350.

No name nugget was found at Bakery Hill, March 6, 1855; it weighed 40 pounds, and was worth $9,600.

The Nil Desperandum nugget was found November 29, 1859; it weighed 45 pounds, and was sold for $10,800.

The Oats & Delson nugget was found at Donolly gold field in 1880, at the roots of a tree; it weighed 189 pounds, and was sold for $50,000.

In addition to the above are the Huron nugget, worth $20,000, and the Empress nugget, worth $27,661. A great number of smaller nuggets, too numerous to mention, have been found.

Many large nuggets or lumps of gold have been found in California during the era of placer mining; but Australia must claim the largest. The California lumps are as follows:

A piece of gold and quartz was found in Calaveras County, on Carson Hill, on the mother lode; it was valued at $42,000.

The Downieville lump of quartz and gold, of Sierra County, as stated by Louis Blanding, gave a value of nearly $90,000; but it was not a nugget.

The mass of gold and quartz found in the Bonanza mine, Sonora, Tuolumne County, gave a value of over $40,000.

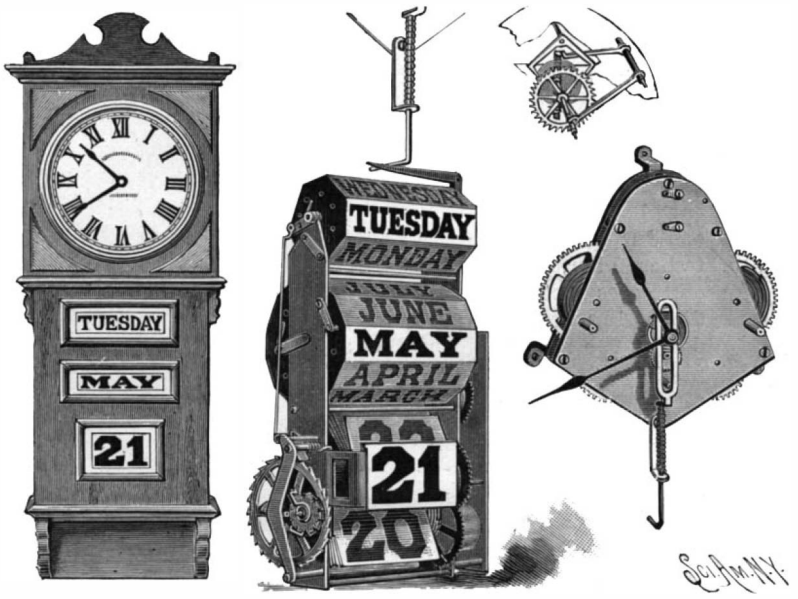
The Australian statistics are correct, I having obtained them from government authority. ARGUS.

THE PRENTISS CALENDAR AND TIME SYSTEM.

The accompanying illustration represents some recent improvements in calendar clocks introduced by the Prentiss Calendar and Time Company, of No. 49 Dey Street, New York City. A device is employed, called the equalizer, which enables the clock to keep the finest regulated time, and renders it practically a mechanical self-winder.

The equalizer is a very simple device for equalizing the power supplied to the train, insuring the most favorable conditions for maintaining a constant rate, and almost entirely eliminating the friction, the Prentiss clock having a Graham escapement, without the increase or decrease of friction to counterbalance the more or less large power of the main spring. On the shaft of the escapement wheel is an eccentric which actuates a pallet to permit a hair spring to take from the main spring, at each unlocking of the release mechanism, sufficient force to keep the pendulum in constant equal motion. This little device is shown in the small figure, and by its means the larger or smaller motive power of the main spring at different periods of its uncoiling is permanently reduced to the same quantity of force adopted by the hair spring. By this means also a low-priced movement may be combined with high grade time-keeping qualities. These clocks are not offered for sale, but are introduced under a rental system, the lessor taking the entire charge of the clocks, attending to the putting in of the system and the setting and regulating of the clocks.

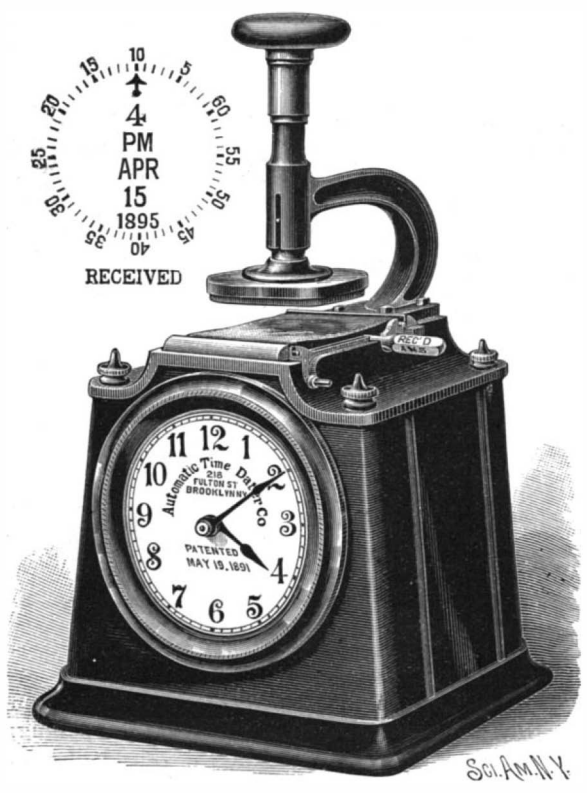
The Prentiss calendar shows full sized printed cards exhibited directly behind sight openings in the case. It is illustrated in one of the views, as well as the manner of its connection with the clock works. It is entirely automatic, continuing after once being set to make all the necessary changes, even to the 29th day of February in leap years, without any adjustment or alteration whatever. It is operated by an independent spring motor, and is wound once a year, the only office of the clock being to release the calendar train once each twenty-four hours.



THE PRENTISS CALENDAR AND TIME SYSTEM.

AN AUTOMATIC TIME DATER.

A device in use at the main offices of the principal railways and in some of the largest business establishments of New York City, to date the time and receipt of telegrams, correspondence, etc., is shown in the accompanying illustration. It is manufactured by the Automatic Time Dater Company, of 220 Fulton Street, Brooklyn, N. Y., and requires but the attention of an eight day clock, or winding once a week. It has a first class clock movement with a continuously revolving minute dial, giving a clear imprint of the passing minute as shown by the clock dial. The clock movement is wholly disconnected from the dater mechanism,



except the connection of the two parts by a single center shaft, and thus the blows on the stamp in no way affect the time-keeping qualities of the clock. Any six words desired may also be given in the imprint, as "received," "paid," etc., the dater, as thus used, making one of the most perfect of legal records. For keeping the time of employes, as a watchman's clock, or for a variety of purposes almost without number, its practical usefulness has been attested.

Triple Screws.

In 1892 the German deck-protected cruiser, Kaiserin Augusta, was launched, and as this vessel is the only large triple screw steamer whose trials had been completed before the United States cruiser Columbia, such particulars as are available will be of interest. The vessel is 393 feet in length, 49 feet 3 inches in breadth, and has a draught of water of 23 feet and a displacement of 6,050 tons. According to the "Warships of the World," the engines indicate 12,000 horse power, and the vessel's speed is 22 knots. Brassey's "Naval Annual" shows that the speed is 20 knots, and that the engines indicate 10,000 horse power, but in a foot note it is stated that the speed was said to be 22 knots on trial. According to other information, the displacement on trial was 5,000 tons, and with 12,616 I. H. P. a speed of 20·86 knots was obtained. The following data regarding the screw propellers appear to be reliable and to have influenced the designers of the United States cruisers Columbia and Minneapolis. The three propellers of the Kaiserin Augusta had all the same diameter, about 14 feet 9 inches, the pitch of the outer screws being 23 feet 4 inches, while that of the center screw is 21 feet 4 inches. The projection of the screws on a thwartship plane shows their axes to lie on the same horizontal plane, the disk circle of the center propeller slightly overlapping those of the outer ones. The center screw is 18 feet abaft the wing screws. Previous to the vessel's trial trip, it had been expected that the center screw would revolve more rapidly than the wing propellers under a specified power, but this was the reverse of what happened. The central screw made five or six revolutions per minute fewer than the side screws, indicating that it had considerably more resistance to overcome.

The United States deck-protected cruiser Columbia was designed in the year 1890, and the Minneapolis is practically a sister vessel so far as the design of the hull is concerned, although, in external appearance, there is a considerable difference, the former vessel having four funnels and two polemasts, while the latter has but two funnels. These vessels are about 412 feet in length, 58 feet beam, and in sea-going trim have a draught of 24 feet and a load displacement somewhat exceeding 8,000 tons. The official trials of the Columbia took place in November, 1893, and the mean speed is officially stated to be 22·8 knots, the mean draught being 22 feet 5 inches, and displacement 7,350 tons, a result showing a propulsion efficiency of 11·9 per cent in excess of that of the twin screw cruiser New York, and actually 21 per cent in excess of that of the Olympia. Before passing on to consider the Minneapolis it may be pointed out that it was not with any idea of obtaining improved speed efficiency that Mr. George W. Melville, Chief Engineer of the United States Navy, adopted triple screw propellers in these vessels. What really led to the consideration of their adoption was the large power that the desired speed required the engines to develop, viz., 21,000 I. H. P. If the vessel had only two propellers, the shafting would have to transmit 10,500 horse power, and it was doubtful whether reliable propeller shafts of that capability could be manufactured with existing appliances in the United States. No doubt other considerations were involved. The results stated to have been obtained have exceeded the most sanguine expectations. This has been most marked in the case of the Minneapolis, which, we are told, has attained a mean speed of 23·073 knots with 20,862 I. H. P.

This unexpected success has been explained to be due to the propellers being of good design and suitably placed. The propellers are of the modified Griffith design, true screw, three bladed, with adjustable pitch ranging from 19 feet 6 inches to 22 feet, all three being adjusted at the Columbia trials to 21 feet 6 inches. The center and starboard screws are right hand and the port screw is left hand. The center screw is 14 feet in diameter, while the wing ones are 15 feet, the helicoidal area is, however, kept about equal by widening the blades of the former. The pitch of the center screw of the Minneapolis on her trial was 21 feet 6 inches and the pitch of wing propellers 22 feet. This difference was made because on the trial of the Columbia the wing engines ran considerably faster than the center engines. Even with the center engines indicating 700 more horse power, only one more revolution per minute was obtained. These results appear to confirm the conclusion drawn from the case of the Kaiserin Augusta that the center screw meets with a greater resistance. Whether that resistance is produced by the effort to drive the vessel forward or by the interference of the wing screws is a matter much more difficult to determine, and is one which must always be considered when comparing the relative efficiency of one, two, and three screws.—Nautical Magazine.

New American Torpedo Boats.

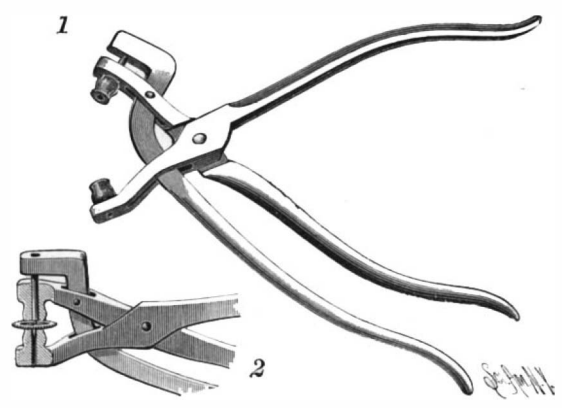
It is reported that Secretary Herbert has awarded the contract for building all three of the seagoing torpedo boats to the Columbian Iron Works, of Baltimore, awarding none to San Francisco, as was at first intended. The boats will be of about 138 tons displacement and will have a speed of about 24 knots. The vessels, exclusive of armament, will cost $97,500 apiece. The Columbian Works were the lowest bidders. Boats of similar dimensions and faster speed are stated to be supplied to the British navy for $72,400 each.

The secretary also has decided that the torpedo boats authorized by the last naval appropriation bill shall be larger and faster than those contracted for. With this end in view, he directed Chief Constructor Hichborn to prepare plans for vessels of 180 tons displacement, to have a speed of 27 knots. The latest English boats of about this class have made 29 knots.

It would be more satisfactory to the public if the American boats were made equal to anything afloat.

A WATCHMAKER'S STAKING PLIERS.

The illustration represents a simple and inexpensive tool for staking or securing staffs or pinions to watches. It has been patented by Mr. Charles C. Branson, of Granite Canon, Wyoming. It consists of a pair of pliers whose jaw members are apertured, the upper one being adapted to receive the stake, while a third or supplemental plier lever has a push portion adapted to engage the stake or punch. All the ejecting parts are connected, and the use of a hammer is entirely dispensed with, the bosses on the jaws being arranged to hold the wheel true and prevent it from being bent. Fig. 2 shows the jaws and the ejecting lever in position for pushing out the staff of a wheel. The tool can also



BRANSON'S WATCHMAKER'S TOOL.

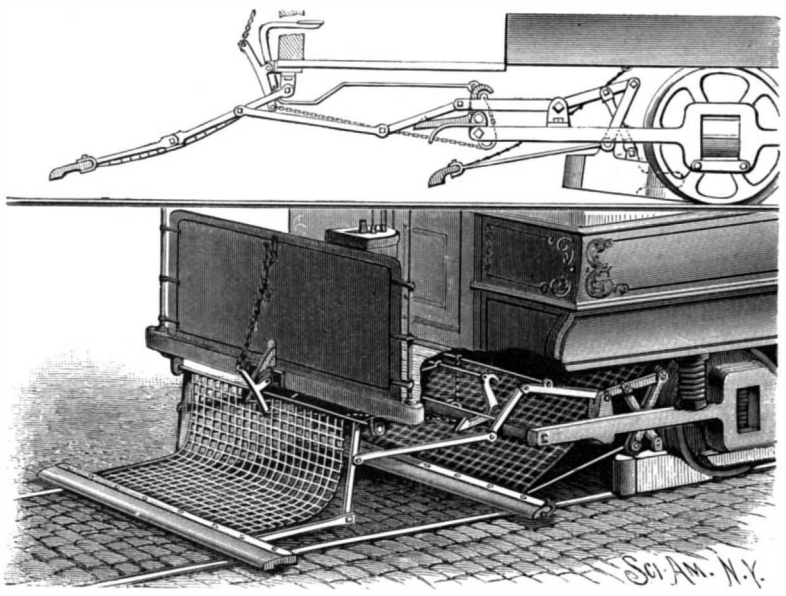
be used to straighten bent wheels or as wheel truing pliers for all the wheels of a watch, to press on hair springs and roller tables, and for putting in arbors and pinions in the wheels.

Effect of Weight on Soldiers while Marching.

An interesting report of experiments ordered by the German War Office to determine the effect of weight on soldiers in full marching order is given in the German Army Medical Magazine, by the two officers who conducted them. The five students who volunteered as subjects marched a distance of fifteen miles and eighty-two yards. The weight in three categories was 48 lb., 59 lb., and 65 lb., and fractions. With the first weight it was found that a man at a moderate temperature could cover the distance with ease; in hot and close weather slight inconvenience was experienced, which disappeared when the march was over, so that the men could begin next day as well as ever. The weight of 59 lb. did no harm in moderate weather, but proved fatiguing when it was hot, and effects were felt next day; and with the third weight of 65 lb. the ill effects were naturally much more decided.

AN IMPROVED CAR FENDER AND BRAKE.

The illustration represents a fender with auxiliary brake mechanism so connected that both are released and moved into operative position at the same time, either by the motorman pressing his foot upon a lever or by an obstruction in the path of the car. The improvement has been patented by Mr. Paul M. A. Stemmler, of Walden, N. Y. The principal view shows the fender down in position to pick up an obstruction in the path of the car, while the other view represents the fender and brake in inoperative position. The fender has side arms pivoted on brackets on the under side of the platform, the lower ends of the arms being pivotally connected with other arms by a cross bar carrying a strip of flexible material adapted to ride on the rails. A netting is attached to the side arms, and they are also pivotally connected by links with a brake shoe adapted to engage the tread of the rail. The brake shoes are also pivotally connected with the side arms of a second fender in the rear of the first one and directly in front of the car wheels. On each side of the car are levers pivotally connected with the brake shoe, and also connected by a link with a foot lever on the car platform, by pressing upon which the motorman or gripman may bring the brake shoes down to engage the rails and the tread of the wheels, at the same time swinging the fender down. When the operator does not see the obstruction, and it strikes the cross strip and bar of the front fender, the levers are also automatically released to move the fenders and the brake shoes into their lowermost position, the fender to pick up an obstruction and the brake mechanism to stop the car.



STEMMLER'S CAR FENDER AND BRAKE.

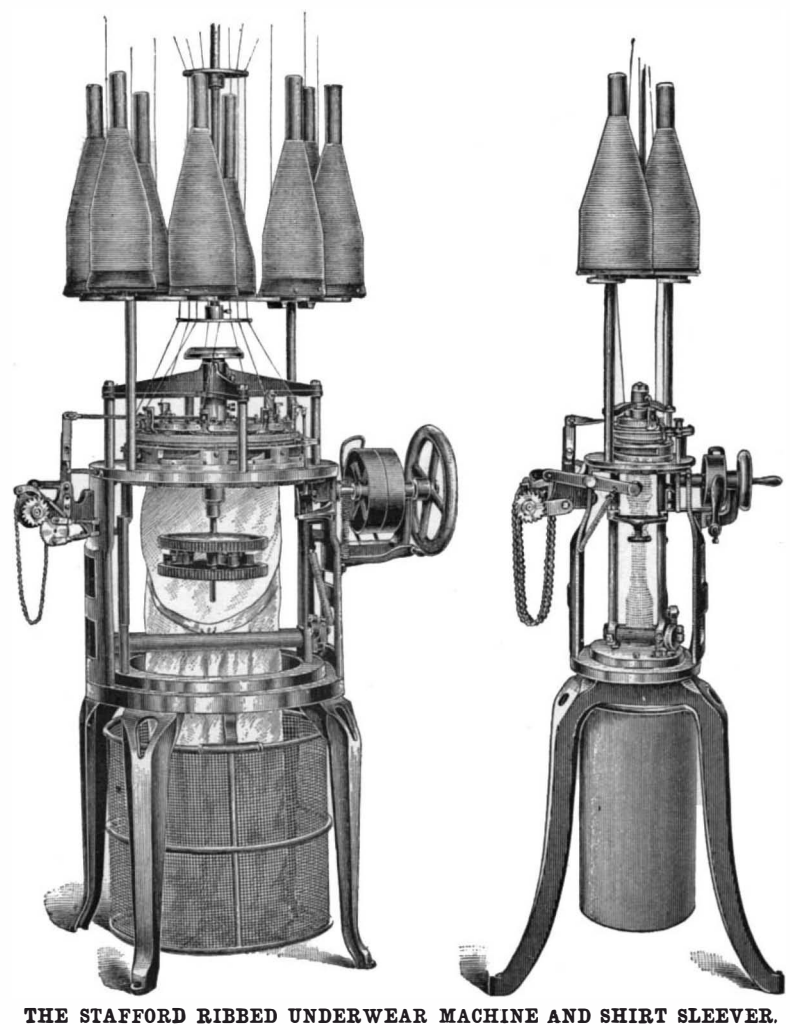
IMPROVED KNITTING MACHINERY.

The illustration represents a new circular ribbed knitting machine for making ribbed underwear, plain or fancy, royal ribbed Cardigan jackets, sweaters, skirts, caps, and jerseys. It is manufactured by Messrs. W. Stafford & Company, Little Falls, N. Y., and has an entirely new automatic take-up. It is of the spring type, worked by an eccentric driven by an incased gear cut on the bed plate of the machine, making a neat, direct-acting arrangement, very sensitive in adjustment and positive in action. The machines are also made with a weight take-up that is very simple and durable, being actuated by a worm gear and wheel which insures smooth and even motion.

Stationary bobbins are employed, making it possible to use the most perfect of stop motions, and the single chain and lever operates the dial cams. The cam rings and plates are made with the cams for each feed on separate segments, so that they can be readily removed without disturbing the needles, while being perfectly rigid when in place. The dial cams can be set in any combination for fancy stitches, and the cylinder draw cams are made to be easily drawn up or out, if desired. The dogs are adjustable from the outside without interfering with the cloth, and have a rolling contact which does not leave a mark. Great care is taken in the design and construction of these machines and all parts are interchangeable, so that duplicate pieces can be obtained at any time to replace parts which may be worn or broken.

In the ribbed shirt sleever the cylinders and dials, as in the larger machines, are of solid hard steel forgings. The cam ring is sectional, and the cams are of cast steel, ground after tempering, the cam system including the latest improvements. By a recent modification the lengths and changes are obtained without the use of chains, by a very easy adjustment, and the machine knits the arm, cuff and welt with or without slack course and widening attachment for arm, the operation being entirely automatic.

This company has facilities for designing and building knitting machines of all kinds, and fixtures to be used in connection therewith, as well as machines for making cut hosiery, mittens, etc. The knitting machines are fitted, if desired, with an electric stop motion, which has proved very convenient and reliable.



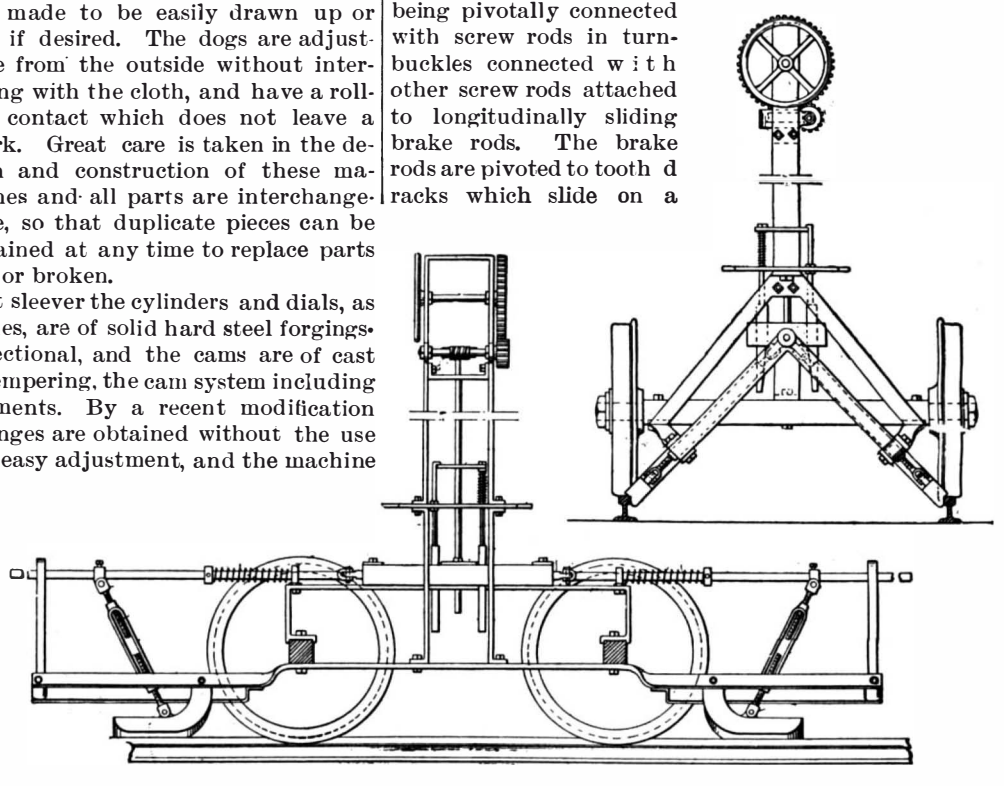
THE STAFFORD RIBBED UNDERWEAR MACHINE AND SHIRT SLEEVER.

Cultivating Sponges.

Sponge farming has been found to be a very profitable industry, and at present there are hundreds of acres in the Gulf of Mexico, along the Florida coast, devoted to this novel purpose. The attempt to grow sponges was first made when it was discovered that the sponge fisheries of the Bahamas and the gulf coast of Florida showed signs of becoming exhausted. It has since been found that under proper cultivation sponges may be raised which are superior in quality and command higher prices than those found at sea. The site for a sponge farm is usually some arm of the sea where the salt water flows in freely. The only preparation necessary is to drop in rocks, stones, and other substances for the sponges to fasten themselves to and to dam up the lagoon so that the sponge seeds cannot be blown out to sea. The farms at first obtained their supplies of sponge seeds from the Fish Commissioners, but latterly they obtain them directly from the sponge fisheries. In the autumn of the year the various varieties of sponges are purchased by the sponge farmer, care being taken to secure both the male and female cells. The sponge seeds are generally kept in small "pounds" during the winter months, and here the masses of protoplasm develop and grow. The spores are liberated early in the spring. They swim about, the eggs grow rapidly and soon attach themselves to the rocks or coral at the bottom of the water. The sponge farm requires little attention after it is once started. The sponges grow slowly, and, as a rule, none are pulled up till the end of the third year. The largest sponges are then gathered and the smaller ones are left to produce new seeds and grow to a larger size. The sponges may be readily gathered on sponge farms, since the water is usually shallow and smooth, and the dangers of ordinary deep sea sponge fishing are not encountered. The finest sponges raised in this way are said to sell for from $1.50 to $3 per pound. If no diseases or enemies get into the sponge beds, the sponges yield large crops year after year. The yearly income from the sponge farm is said to range from $1,000 to $10,000, according to its size, location, and age.

AN IMPROVED CAR BRAKE.

The illustration represents, in side and end views, a simple but very powerful brake recently patented by Mr. Frederick L. Desmoineaux, of Lawson, Col., in which the brake shoes are applied to the rails instead of to the wheels. Extending longitudinally of the truck is a frame between whose flat side pieces are pivoted swinging shoes, adapted to swing downwardly and outwardly to engage the track rails, the shoes being pivotally connected with screw rods in turnbuckles connected with other screw rods attached to longitudinally sliding brake rods. The brake rods are pivoted to tooth d racks which slide on a plate fastened centrally to a truss, and the rods are spring-pressed to hold the shoes out of engagement with the rails, but by pressing upon a foot piece the shoes are swung firmly against the rails. By turning a hand wheel, also, the brake shaft may be turned with great power to firmly set the brakes.



DESMOINEAUX'S RAIL BRAKE.

Height of Ocean Waves.

Dr. G. Schott, as the result of studying the form and height of the waves of the sea, claims that under a moderate breeze their velocity was 24·6 feet per second, or 16·8 miles an hour, which is about the speed of a modern sailing vessel. As the wind rises, the size and speed of the waves increase. In a strong breeze their length rises to 260 feet and their speed reaches 360 or 364 feet per second. Waves the period of which is 9 seconds, the length 400 or 425 feet, and the speed 28 nautical miles per hour, are produced only in storms. During a southeast storm in the southern Atlantic Dr. Schott measured waves 690 feet long, and this was not a maximum; for in latitude 28° south and longitude 39° east he observed waves of fifteen seconds' period, which were 1,150 feet long, with a velocity of 78·7 feet per second, or 46⅛ nautical miles an hour. Dr. Schott does not think that the maximum height of the waves is very great. Some observers have estimated it at 30 or 40 feet in a wind of the force represented by 11 on the Beaufort scale (the highest number of which is 12); and Dr. Schott's maximum is just 32 feet. He believes that in great tempests waves of more than 60 feet are rare, and that even those of 50 feet are exceptional. In the ordinary trade winds the height is 5 or 6 feet. The ratio of height to length is about 1:33 in a moderate wind, 1:18 in a strong wind, and 1:17 in a storm; from which it follows that the inclination of the waves is respectively about 6°, 10°, and 11°. The ratio of the height of the waves to the force of the wind varies greatly.

A Fast Torpedo Catcher.

The Bruiser is the latest addition of the torpedo destroyer class to the British navy. She is 201 feet 6 inches long, 19 feet wide, 13 feet deep, 7 feet 4 inches draught, 220 tons displacement, 4,156 I. H. P. Polished propellers having three blades. On her recent trial in boisterous weather the mean speed of six mile runs was 28·14 knots per hour. The speed for three hours was 27·97 knots.

Hadfield's Projectiles.

In some recent trials, projectiles manufactured by Hadfield's Steel Foundry Company, Limited, have been very successfully tested by the government officers at Shoeburyness. Out of 290 projectiles forwarded two were selected for trial at plates of Cammell's make, 9 inches thick and 4 feet square. The first shot was fired at 155 yards range, the striking velocity being 1,873 feet and the striking energy 2,468 foot tons. In the second case striking velocity was 1,897 feet and the striking energy 2,532 foot tons. In each case 48 pounds of powder was used. The first shot penetrated the plate and was recovered whole, the impact being 0·036 inch. The projectile was uninjured. The second shot behaved in a similar manner; but the point was broken off. On these trials the whole consignment was approved as satisfactory, and accepted as according to specification. Another similar consignment has also been accepted by a foreign government. The difficult nature of the trial may be gathered from the fact that the face of the plate against which the experiments were conducted contained 1 per cent carbon. Occasionally the facing ran as high as 1¼ per cent. Some little time ago the company supplied the government with an order, and one of their ordinary 6 inch projectiles, taken out of stock at Aldershot, was fired through a 9 inch plate and was recovered uninjured. The projectile was put a second time into the gun, and again went through a 9 inch plate. A third time the shot, after being ground up, was put into the gun, and fired against a hardened plate, and was only then broken up. Some time ago one of Hadfield's shot, with specially shaped head, was fired against a 6 inch Harveyed plate of the latest type. The ordinary projectile of chilled iron would have been entirely broken up; but Hadfield's special design penetrated the 6 inch plates, thus showing that the Harveyed armor is not so invulnerable as it is supposed to be.

Manufacture of Smokeless Powder.

The wood fiber, which is the basis of Schultze powder, is purchased in a form resembling coarse blotting paper. It is cleaned and torn up into shreds until as light and fluffy as cotton wool, and dried. A certain quantity of this fiber is weighed off and passed into the nitrating house. Into each tank is placed a mixture of strong nitric acid and sulphuric acid. While the former of these chemicals enters into the composition of the explosive, the latter is only there for the subsidiary purpose of absorbing the water that is formed in the main chemical process, which begins the moment that the wood fiber is introduced. After a thorough immersion, the wood fiber and the nitric acid have formed that important alliance which is responsible for the explosive properties of Schultze powder.

The next series of processes are for the purpose of removing every trace of free acid from the nitrated fiber, or nitrolignin as it is termed. The latter substance in its pure state is stable and reliable. It may be stored, heated within reasonable limits of temperature, and in many ways treated with a good deal of familiarity; but should there remain the slightest trace of uncombined acid, many uncertainties arise, and the resulting powder will not satisfy the severe requirements of our Home Office. The wet mass taken from the nitrating tank is put in a centrifugal machine, where a large proportion of superfluous acid is removed, and then it is tipped into cold water. After this it has no peace for about four weeks—it is boiled, it is torn up and disintegrated by "devils," and rolled under five ton edge runners.

The nitrated fiber is now ready, granting of course that it is passed by the chemist in charge, for the second portion of its treatment, viz., its formation into grains. In the first place it is filled into small sacks, and placed under a hydraulic press, from which it emerges comparatively dry and in the form of a hard cake. After this it receives a further course of edge runners, and the opportunity occurs for adding to the nitrated fiber the other ingredients, of which oxidizing salts and paraffin are chiefly notable. The next process is the simple one of shaking it up on sieves with a very fine mesh. This causes the detached pieces of fiber to become granular as a result of the bumping they get against one another; and when grains small enough to pass the mesh are formed, they fall through and are collected beneath. A repetition of this process in a sieve with a smaller mesh serves to improve the form and regularity of the grains.

The manufacture of Schultze powder is now approaching completion, for these grains have only to be dried, and then they will resemble this powder as it was prior to the beginning of last year; but now the hardening process is added. We need not linger over the drying, beyond stating that the powder is spread on canvas trays and a current of warm air is passed through it until the drying is complete.

The grains are hardened by being placed in revolving barrels, kept at a fairly high temperature by hot water jackets, and having poured into them a collodion mixture. The effect of being shaken up in close contact with this mixture under favorable conditions of temperature is for the collodion to penetrate to the interior of the somewhat loosely built up grain and form a glaze in and around it, the outer surface being left somewhat harder than the interior. For reasons of economy the spirits are volatilized and condensed to the amount of 90 per cent of the original quantity into their prior form, so as to be used over again. That this hardening process has improved the powder is evidenced by the greatly increased sales registered during the past year.

After a careful sifting of the grains, the powder is passed into one of the magazines.—Arms and Explosives.

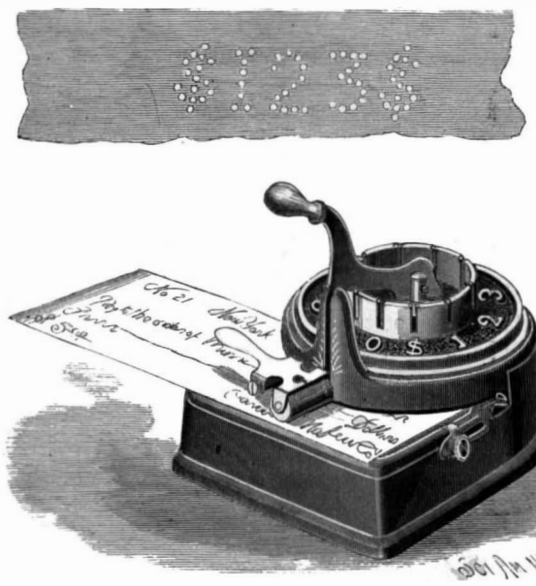
THE NAFEW-LOVELL CHECK PROTECTOR.

The illustration represents a recently introduced check protector. A new feature in the construction of this check perforator is a flexible die and a yielding anvil, which are so combined and arranged as to entirely obviate the need of the punches being kept sharp, thus insuring satisfactory work indefinitely.

By removing the cover, which is readily done by taking out the three screws in the base, the whole of the mechanism is within easy reach and touch, and simplicity of action combined with durability is at once seen. The action of the entire device is clean and accurate, and the moving parts instantly respond to the operating lever.

As will be seen, it is utterly impossible to raise checks in which the sums called for have been punched out, as shown, with the dollar mark punched after the last figure of the amount of each check. All banks are pleased to see such improvements adopted by their customers, as this one is an absolute preventive against one kind of forgery.

In operation, an adjustable guide piece, at one side, is placed as required to cause the punched figures to come in the right place, when the check is slipped in



A NEW AND SIMPLE CHECK PUNCH.

the punch with one end against the guide. The disk on which are the figures is then moved in either direction to bring the first figure to be punched under the punch lever, the disk being correspondingly moved for each succeeding figure, and the check being automatically moved along by the feed device in front, the latter being raised by its finger piece to release the check punch after punching. The picture also represents the figures as punched.

The machine is manufactured by the Samuel Nafew Company, No. 26 Cortlandt Street, New York City, U. S. A.

African Mahogany.

The Southern Lumberman says that mahogany logs from the west coast of Africa have got as far as Louisville, Kentucky, and adds that it is much cheaper than the mahogany from Central America and Cuba. From these mahogany forests in Africa it is said that twelve million feet of lumber have already been cut and exported, and they promise to yield an immense revenue to the British and French colonists who have seized upon the territory. The wood has a tinge of pink in contrast with the somewhat reddish color of the American variety, and some of the squared logs which have been imported are two by three and a half feet in size. We may add that some of this African mahogany is the wood of Khaya senegalensis, a tree which belongs to the same family as the true mahogany, and is closely related to it. It is not so desirable a cabinet wood as the Mexican or Cuban mahogany, but is more like the Central American wood. Occasionally there are logs richly figured, and these have been manufactured here into very attractive veneering.

THE chime whistle has been adopted as standard for passenger locomotives on the Pennsylvania Railroad. Many of the engines are already equipped with these whistles.

Photography and Law.

BY WM. GEO. OPPENHEIM, PH.D., L.B.

Is it or is it not a vicious doctrine to deny all right of privacy even to concededly public persons?

Should the rights of the public be recognized only in public side or public relations of a public man—not in his whole personality?

Presiding Judge Van Brunt (General Term, first department, New York) held (64 Hun., 594) as follows:

"It is undoubtedly true that by occupying a public position or by making an appeal to the public, a person surrenders such part of his personality or privacy as pertains to and affects the position he fills, or seeks to occupy; but no further."

Is it not true, then, that the law of privacy ought to permit a statesman, or inventor, or artist, or philanthropist, no matter how famous he becomes, to enjoin the publication of his picture or the erection of a statue, if such form of publicity is distasteful to him or her?

In the case of Marion Manola v. Stephens, the New York Supreme Court, at special term, granted an injunction under the following circumstances, which appears to be a precedent for restraining—at the suit of a living person—the circulation of her pictures, even though she be a public character.

"The plaintiff Manola alleged that while playing in a New York Broadway theater, in a role which required her appearance in tights, she was, by means of a flashlight, photographed surreptitiously and without her consent from one of the boxes of the theater."

The court issued an injunction to restrain any use being made of the pictures so taken.

An actress would seem to be a public character, and, moreover, the picture in question was taken of her while actually officiating in her public capacity.

This would seem to argue that even a living public character has a right to enjoin the publication of a distasteful picture.

The question is, however, more difficult of solution with regard to deceased persons, and the general nature and limitations of such rights are not rendered clear by the various opinions delivered in the celebrated case of Schuyler v. Curtis, now on appeal to the New York Court of Appeals.

In the latter case, the action was brought by relatives of the deceased, Mrs. Schuyler, to restrain the erection of a proposed statue to her in the World's Fair at Chicago, as "The Typical Philanthropist."

The views expressed in the Manola and Schuyler cases seem to be at variance with the Corliss case in the Federal Circuit Court, in which the decision containing the following language was rendered by Mr. Justice Colt:

"But while the right of a private individual to prohibit the reproduction of his picture or photograph should be recognized and enforced, this right may be rendered or dedicated to the public by the act of the individual, just the same as a private manuscript book or painting becomes (when not protected by copyright) public property by aid of publication.

"The distinction in the case of a picture or photograph lies, it seems to me, between public and private characters.

"A private individual should be protected against the publication of any portraiture of himself; but where an individual becomes a public character the case is different.

"A statesman, author or artist, or inventor, who asks for and desires public recognition, may be said to have surrendered this right to the public. When any one obtains a picture or photograph of such a person, and there is no breach of contract or violation of confidence in the method by which it was obtained, he has the right to reproduce it, whether in a newspaper, magazine, or book. It would be extending this right of protection too far to say that the general public can be prohibited from knowing the personal appearance of great public characters. Such characters may be said, of their volition, to have dedicated to the public the right of any fair portraiture of themselves."

This action, it will be noted, was brought by Mr. Corliss' widow and children.—American Amateur Photographer.

Naval Carrier Pigeons.

Prof. Marion, instructor of modern languages at the United States Naval Academy, who has charge of the pigeon loft there, says that Secretary Herbert is entirely in favor of the system of the use of carrier pigeons in the navy, and that it is the hope of those interested to have carrier pigeon cotes at all our naval stations.

Last summer birds were taken aboard the Monongahela and the Bancroft on the summer cruise of the cadets, and during the whole period only nine birds failed to appear, or less than ten per cent of the entire number. Prof. Marion states that the flights of his birds have in several instances been as long as 200 miles over the ocean, with a speed somewhere near thirty miles an hour.

Correspondence.

The San Blas Sea Level Canal.

To the Editor of the SCIENTIFIC AMERICAN:

Great and useful projects never die. They are talked over and discussed from year to year, from generation to generation, until public confidence justifies the outlay. The requisite capital, labor, and engineering skill are procured, the work is accomplished, and then we wonder why it was not done before.

Such was the case of the Suez Canal, the Atlantic cable, the St. Gothard and Mont Cenis Tunnels, our great continental railroads, and such will be the case with a sea level ship canal across the American isthmus, through which the trade of the Pacific Ocean is destined to pass and renew commerce on the grandest possible scale.

The advantages claimed for the San Blas route over all others proposed are the following:

1st. The San Blas route is about 30 miles long, the Panama is 46 miles long, and the Nicaragua route is about 170 miles long. Every one familiar with transits must see at a glance that a short route in every respect is decidedly better than a long one.

2d. The San Blas route has at both ends good, natural harbors, requiring no improvements. The Panama route has fair harbors, while the Nicaragua route has, on the Pacific side, an open roadstead, which, to protect from violent winds, it is necessary to build an expensive breakwater. On the Atlantic side an entire new harbor will have to be made, the cost of which it is impossible to determine in advance, with any degree of certainty as to time or money.

3d. The San Blas route is a direct, straight line from sea to sea, while the other two routes are very crooked, and, in consequence, it would be difficult for large ships to pass through the canal without striking its banks, which will have to be lined with something more firm and durable than earth to keep them from washing and falling into the canal during the rainy season, as the annual rainfall on the Atlantic side of the isthmus is about 123 inches.

4th. The San Blas route, as above stated, is 30 miles long, including the Bayano River, 10 miles of which, with but little dredging, can be made ample for ship navigation, thus leaving only 20 miles of canal excavation. Of this, however, 7 miles would be a tunnel, 120 feet high above canal bottom to the crown of the arch and 80 feet wide at the water line, which would give ample room to pass the largest ships, by striking their topmasts and hauling yards around, so often done when in ports. The open or remaining portions of the canal are to be 125 feet wide and 28 feet deep throughout, which would enable two ships to pass each other with safety and ease outside of the tunnel.

5th. The San Blas route is remarkably free from floods, especially on the Pacific side, where the longest slope of open cutting and heaviest work will be done, while on the Panama and Nicaragua routes it is quite the reverse, as their works will be chiefly on the Atlantic side, where the heavy rains and flood waters rushing down the Chagres and San Juan valleys would be a constant menace to the safety of the locks and dams proposed on those routes.

6th. The San Blas is a sea level route, while the other two routes contemplate at least six dams and locks on each, which are very expensive structures to build and keep in order. Even if one lock should, from any cause, fail to work, the passage in the canal would be blocked until it was repaired, which might take ten days or ten months. An earthquake heavy enough to destroy the San Blas tunnel would destroy the locks and dams on those routes.

7th. The San Blas Canal would be fed by the never-failing waters of the oceans, while the Panama route, with its recently proposed locks, does not solve the problem of controlling the flood waters of the Chagres River, nor does it remove the fear of an inadequate supply of water on the summit, during the dry season, to feed the canal for the passage of large ships, the size of which is being continually increased, as the Pacific Ocean is where steamships are destined to achieve their greatest triumphs.

8th. The great advantages of a short, direct sea level canal like the San Blas, through which ships can pass quickly, on an even keel, over one incumbered with locks and dams, so liable to get out of order in the rainy isthmus climate, are so well known to all who have studied the question it seems like a waste of time to discuss in a brief letter like this.

9th. The total quantity of material to excavate on the San Blas route, including the tunnel for a canal 125 feet wide at the water line and 28 feet deep throughout, would be about 30,000,000 cubic yards; while on the Panama route for a canal of that size and character it would require the removal of 130,000,000 cubic yards of rock and earth.

10th. The only objection that can be urged against the San Blas route is the tunnel, but that in these days of steam and compressed air drills and modern explosives, by the use of which the expense of tunneling is being reduced nearly one-half less than the old mode of hand drilling, should not be considered a very serious undertaking.

11th. The success of the St. Gothard Tunnel, over 9 miles long; the Mont Cenis, 7 miles long; the Simplon Pass Tunnel (being built), 13 miles long; and seriously planning one under the British Channel, 20 miles long, should encourage us to build the San Blas Tunnel, especially in view of the fact, it will give us a sea level canal across the narrowest part of the isthmus, through which the ships of all nations can pass quickly on an even keel.

12th. All the leading trunk lines of railroads in our country are gradually lowering their grades and shortening distance regardless of tunneling, which they do not fear on account of the cost, as by means of these improvements the roads gain large reduced running expenses, time, and economy—the essential elements of success in trade all over the world. To pass a ship through the San Blas Canal, towed at the rate of 3 miles per hour, would take but ten hours; while to pass a ship through the Nicaragua Canal, towed at the same speed, would require sixty hours.

13th. Estimating the cost of the heading in the San Blas Tunnel at $20 per cubic yard, the breakdown below at $8 per yard, the open rock cutting at $3 per yard, earthwork at from 50 cents to $1.50 per yard, masonry at $15 per yard, concrete at $7 per yard, pumping at $3,000,000, lining the tunnel throughout, if found necessary, at $32,000,000, contingencies at $20,000,000, the cost of the canal complete, from ocean to ocean, would be about $130,000,000.

This would give us a short sea level canal through the narrowest part of the isthmus, to pass the largest ships on an even keel, and accommodate the ever-expanding demands of commerce for all time.

I wish to call your attention to the Darien route, examined a short time ago by Mr. G. A. Harvill, of Louisville, Ky., who claims it is about 24 miles long from deep water in the Gulf of San Miguel, on the Pacific, to the Bay of Candilaria, on the Atlantic Ocean, although the total distance through the isthmus at this point is about 90 miles. Including a tunnel of only 2½ miles in length, he believes a sea level canal can be built there for $60,000,000. It is very important that this route should be thoroughly surveyed, in order to test the accuracy of his estimates of quantities and cost.

FREDERICK M. KELLEY.

487 Hudson Street, New York, April 18, 1895.

Comments on "An Answer to Strindberg."

To the Editor of the SCIENTIFIC AMERICAN:

Perhaps, in behalf of those women who have not yet spoken for themselves, you will publish this letter.

In the issue of the SCIENTIFIC AMERICAN for April 13, I find a reply to Strindberg's article on the "Inferiority of Woman," written by Mrs. A. S. Rudy. I would like to say that I believe the above mentioned article would have been better answered if that reply had never been written. In the first place, it is hardly right for a woman to take up the cudgels in her own behalf in this special case; there is always the danger of internal evidence in her defense bearing weight against what she wishes to prove, because she is from the nature of the case partial, and the more vigorous she is in her arguments the more excited she becomes, and so, not so just a controvertist. Had she waited, no doubt some man who believes in the equality of the sexes would have expressed himself forcibly in our defense, and calmly and justly, and less partially than any woman; for, as said before, the question does not touch him so closely as, ex natura, it touches a woman.

As to the reply itself, if I may be permitted, the internal evidence there is against exactly what Mrs. Rudy would defend, the equality and advancement of woman. She does not believe in evolution; she would "rather" believe in Genesis. It is precisely that fact, that she believes what she prefers to believe rather than the truths disclosed by science. No one now who has any general knowledge—except a few of the equal-woman kind—believes that the first of Genesis is aught but a beautiful legend; so her arguments based on that creation of woman not only do not tell, but they count against her on Strindberg's side.

Also please allow me to say that if there is anything nauseating under the sun, it is the spectacle of a woman who stands before the public and cries: "Love me, venerate me, adore me; I am God-given!" Imagine any one saying such a thing as that in a small circle. Alas! that is what these "hysterical and passionate outbursts" lead to when women talk before they think. Mrs. Rudy's article is an excellent example of Strindberg's woman "when refused something it wants."

Her arguments are no arguments; her vituperation is idle; her excitement is, alas! a sample of Strindberg's woman.

It is with no maliciousness that I write these words; it is simply because so much has been written and spoken about "woman" that it has become disgusting and sickening, and the women who have not written and spoken are getting tired of being dragged up before the public and posed as saints and superior creatures, when they know that they belong to the same human family to which men belong and are also subject to human frailties.

FANNY S. EDGERTON.

1634 Michigan Boulevard, Chicago, April 14, 1895.

Amylotryose—A New Sugar.

At a recent meeting of the Chemical Society in London, A. R. Ling and J. L. Baker read a paper in which they stated that they had examined the hydrolytic products of starch when acted on by diastase. The diastase was obtained from different sources and prepared by different methods. The authors confirmed the previous results recorded by Brown * and Morris, since they obtained maltodextrin, the physical constants of which were determined and found to agree with those given by Brown and Morris. "Isomaltose," another product of the hydrolysis of starch, was also isolated, and the osazone on examination possessed the same melting point as that recorded by Lintner.† The isomaltose was purified by crystallization and precipitation from methylic alcohol solution by absolute alcohol. The isomaltose thus obtained agreed in these respects with that obtained by Lintner, but on treatment with sodium acetate and acetic oxide, a mixture was obtained from which octacetyl-maltose was separated and identified. The isomaltosazone was also proved to be a mixture, since maltosazone was separated and identified. Further experiments on the action of diastase and the determination of its reducing power showed that isomaltose is not a homogeneous substance, but a mixture of maltose with probably two other substances. One of these was separated, and from examination of the osazone is probably a new sugar—$C_{18}H_{32}O_{16}$—for which the name amylotryose is proposed. The other substance present in isomaltose appeared to be a dextrin, which, however, was not identified. H. Brown, F.R.S., stated that experiments in progress in his laboratory confirmed the conclusions recorded above as to the non-homogeneity of isomaltose so far as that it was not a pure substance nor an isomer of maltose. Dr. Kipping suggested that a better name for the new sugar would be triamylhexose.

Recent Earthquake in Europe.

A series of severe earthquake shocks were felt in southern Europe on April 14 and 15, during which many people were killed or injured, and much other serious damage was done. The shocks were particularly severe throughout Austria and in northern Italy. At Laibach near Trieste thirty-one distinct shocks were felt, and the churches, business houses, and dwellings of the town were badly damaged. Many people were severely injured and some killed by the falling walls. Slight seismic vibrations were also felt in Vienna, and reports were brought by those arriving in Vienna during the day of disasters in adjoining cities. Thousands of people had been seen camping in the open fields, having been driven from their homes. Severe shocks have also been felt at Venice and Verona. Many buildings were injured and a number of people were killed. In Venice people fled from the houses to the open squares, and many travelers and many residenters have left the city.

During the past year Europe has been visited by a number of more or less violent earthquakes, several of which have done great damage. The principal earthquakes were felt in Greece and Turkey. These, it will be remembered, lasted for more than a week, causing the death of over four hundred people and rendering 20,000 people homeless and destitute. Later in the year two other earthquakes were felt in Greece of a less dangerous character. Severe shocks were also felt in Turkey. Great damage was done at Constantinople; some two hundred lives were lost and the injury to property was estimated at $30,000,000. During the year there were also several shocks felt in Great Britain, but apart from the general alarm caused by them they seem to have done little actual damage.

Lenz, the Missing Wheelman.

A dispatch received by Dr. Worman, of Outing, states that Frank Lenz, the missing tourist, had been traced to the village of Chilgani, in the Alasgird plains outside the Delibaba Pass. A native of Chilgani says that Lenz arrived there on May 9, just before sundown, and became the guest of Avak Parsegh. He was in good health and spirits, and held a sort of reception that evening, when many of the natives came to see his machine, in which they seemed to take much interest. He spoke a few words of Turkish and they seemed to like that. The next morning he left Chilgani, and a month later a report was circulated among the villages that he had been killed in the vicinity of Koord Ali. There are four villages in the neighborhood, Chilgani, Koord Ali, Zedikan, the last of the Armenian villages of the plain, and Delibaba, at the foot of the pass of the same name. The pass is seventy or eighty miles from Erzeroum. Koord Ali is about five miles from Zedikan, so that this last report is that Lenz was killed before he reached the mountain pass. Dr. Worman thinks that he is held a captive.

* Trans. Chem. Soc., 1885, p. 561, cf. Herzfeld, B. XII, 2120.

† Zeit. Brauwesen, XV, 145.

THE WEST SIDE METROPOLITAN ELEVATED RAILWAY SYSTEM OF CHICAGO.

Visitors to the Chicago World's Columbian Exposition remember the Intramural Railroad which carried such numbers of people on its elevated structure by electric propulsion. This was an example of an electrically operated elevated road. There is now in process of construction another electric elevated road in Chicago; one which, starting from the lake front in the heart of the business district, is to reach by several branches the entire area bounded by the branches of the Chicago River and denominated the West Side. The road is termed the West Side Metropolitan Elevated Railroad. With a track carried on an open-hearth steel elevated way, with plate girders throughout, built upon land owned in fee simple by its projectors, except for street crossings, and operated by the most advanced electric system of propulsion, the road will occupy a unique position.

The entire length of the road, including a trunk line which runs directly away from the lake front, and including four branches into which it ultimately separates, is nearly 18 miles.

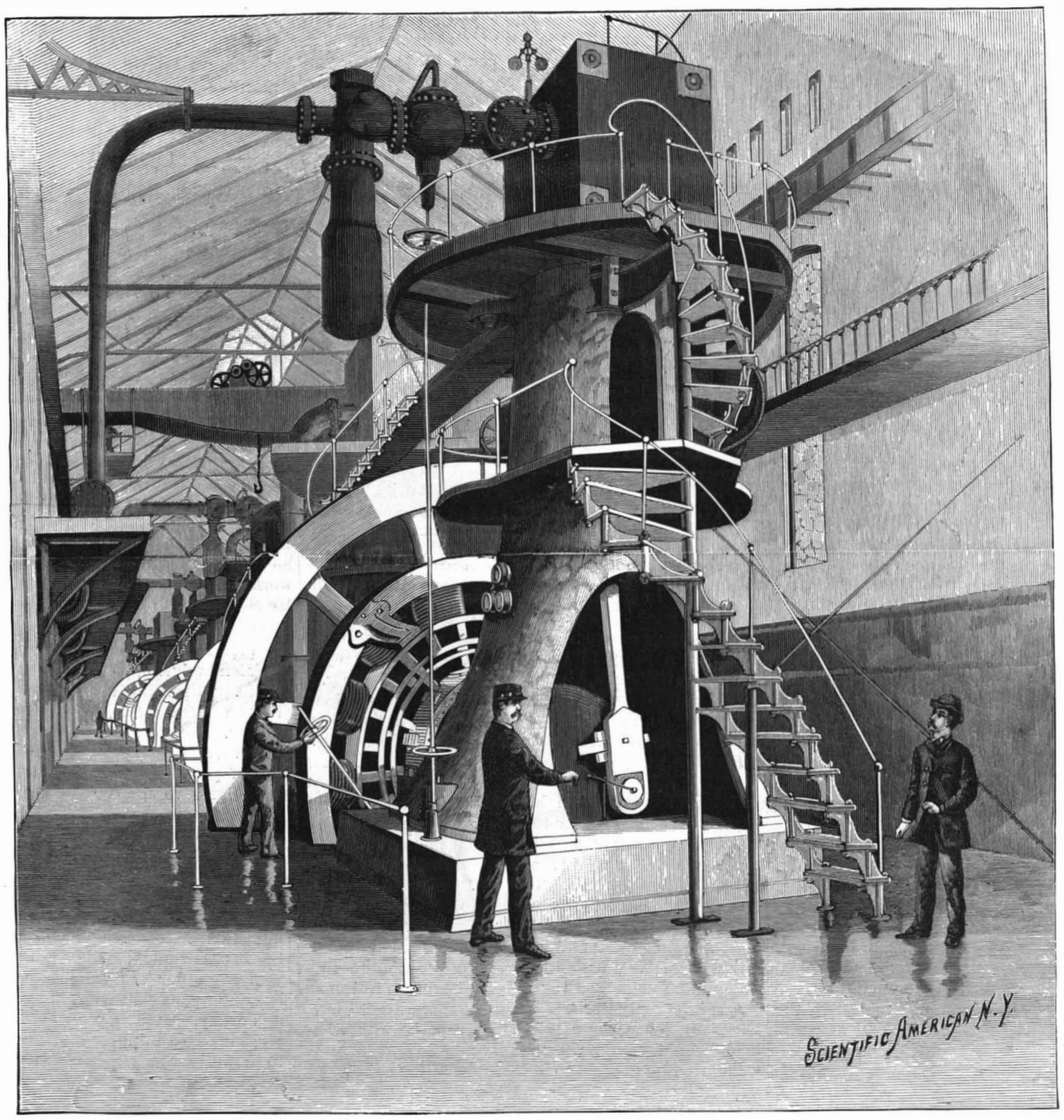
The main line, starting on Franklin Street and running west to Paulina Street, is 1·81 miles long, but having four tracks is rated at double this length. From Paulina Street west to the city limits the main line becomes the Garfield Park branch, 4·02 miles long. The Logan Square branch starts from the same point on Paulina Street and runs north and then northwest to Logan Square, 4·49 miles. The Humboldt Park line, branching off from the Logan Square line, runs west, 2·13 miles. Finally the Douglas Park line runs south from the Paulina Street terminus of the main line and then west a distance of 3·7 miles. All the branches are two track. It is calculated that five-eighths of the population of Chicago live within the West Side area, and this immense population of about 800,000 people will be served by the road. The company has issued $15,000,000 of bonds to supply its actual capital, besides stock of the same face value. One of the most advanced features of the enterprise is its acquirement of a right of way.

The path of the road lies through the center of the blocks, and the land acquired, partly through condemnation proceedings, was purchased outright, the company thus acquiring the solid lots, which enables it to proceed in the disposition of the property in any way it saw fit. The company was thus absolutely secure from damage suits, and could proceed in the work of demolition in any desired manner. Much of the way was cleared by the destruction of the edifices, and one of our illustrations, made by our special artist, shows the view down the roadway as it is being prepared for the superstructure.

Advantage is also taken of the ownership of the land to erect the stations directly under the track. From the stations, which, unlike the elevated stations of the Metropolitan Elevated RR. in New York, are on the street level, stairways lead to the platforms above, all being under cover. Not content with the purchase of its roadway, nearly $400,000 worth of surplus land was purchased. This was to afford ground to which the more valuable houses on the roadway might be moved. One of our illustrations shows the operation of moving a number of brick dwelling houses, in solids, on rollers, to a new locality.

The superstructure shown in another of the illustrations, where it is seen crossing a street, is of the most substantial type. The weight per lineal foot is put at about 1,000 lb., a total of 46,000 tons for the entire structure. The rails weigh 80 lb. to the yard. The steel is from the Carnegie works.

The cars are to be operated in two to five car trains, one of which will be a traction car taking its current from a special bar or rail laid on the deck. The system adopted is that of the General Electric Company. It is needless to say that the operation of an elevated road by electricity represents the perfection of traction systems as far as passengers and dwellers on the line are concerned, as there will be no smoke or noise of escaping steam. The traction car, which takes the place of the ordinary locomotive, is so constructed as to carry passengers, and will be a smoking car, and thus a very practical economy in the system is attained.



ELECTRIC GENERATING PLANT OF THE WEST SIDE METROPOLITAN ELEVATED RAILROAD.

Electric service for construction work on such portions of the road as were completed was put in operation some months ago.

A view of the electric generating plant is given in one of our illustrations. The immense generators are of the multipolar type and are direct driven, the armatures being on the main engine shaft. One type of generator driven at 75 revolutions per minute maintains a voltage of 500 on no load and 600 loaded with a current of 2,230 amperes. Another type at 100 revolutions gives 500 volts with no load and 550 volts with full load and a current of 1,450 amperes. They are of the type built by the General Electric Company especially for street car work. The armature winding consists of heavy bars of copper insulated by mica. They were wound when in place. There are twelve field magnets in the circle inclosing each armature. It was only after the winding of the armature and setting up of the field around it that the engines were assembled. The engines are Allis Corliss, and are compound inverted vertical, direct acting, standing some 50 feet high with 25 foot flywheels. There are five; two are of 2,500 horse power each, the others of 1,000 horse power each. The dynamo comes between the high and low pressure sides, so as to be inclosed by the engine frames. It is claimed that the energy stored up by the flywheel at full speed is enough to run a train of cars from the power house into the city. A Morgan electric crane of 75 tons capacity, also shown in the illustration, spans the engine house, commanding the entire area.

The massive switches required for the large currents delivered are mounted on a white marble base plate. The current from the power house goes to the car motors by the lateral contact rail and returns by the regular rails to the station, a system used on the World's Fair road. Each car will carry four motors, so that maximum efficiency will be given at three different speeds. On starting, the motors are thrown into series; at the next speed two are in parallel and two in series, and at the highest speed all are in parallel. Air brakes will be used, a small motor working the air pump on the motor car.

Sixteen Babcock & Wilcox boilers with automatic stokers supply steam for the engines. A moving grate carries coal to the fire and delivers ashes from the further end. All the firemen have to do is to keep the coal hopper full of coal. In addition to a 150 foot iron chimney, two huge rotary blowers are used to supply the draught. The main steam pipe is eighteen inches in diameter.

The entire generating or power plant is arranged to admit of increase without any disturbance of existing parts. It is located on the alley back of Throop Street, between Van Buren and Congress Streets, directly in the rear of the city lighting plant.

The part to be performed by this road in Chicago cannot well be overestimated; constructed in the most substantial way, and free from possibility of judgments against it for damages to property, it has two of the best guarantees for success. It will reduce the present time required to reach its limiting points thirty minutes. If all goes well, it will doubtless extend its lines. By using its alleys Chicago saved much of her streets from elevated railroad structures, at the sacrifice of the alleys. The present road sets an example in the acquirement of its own private roadway, leaving the streets intact except where it crosses them.

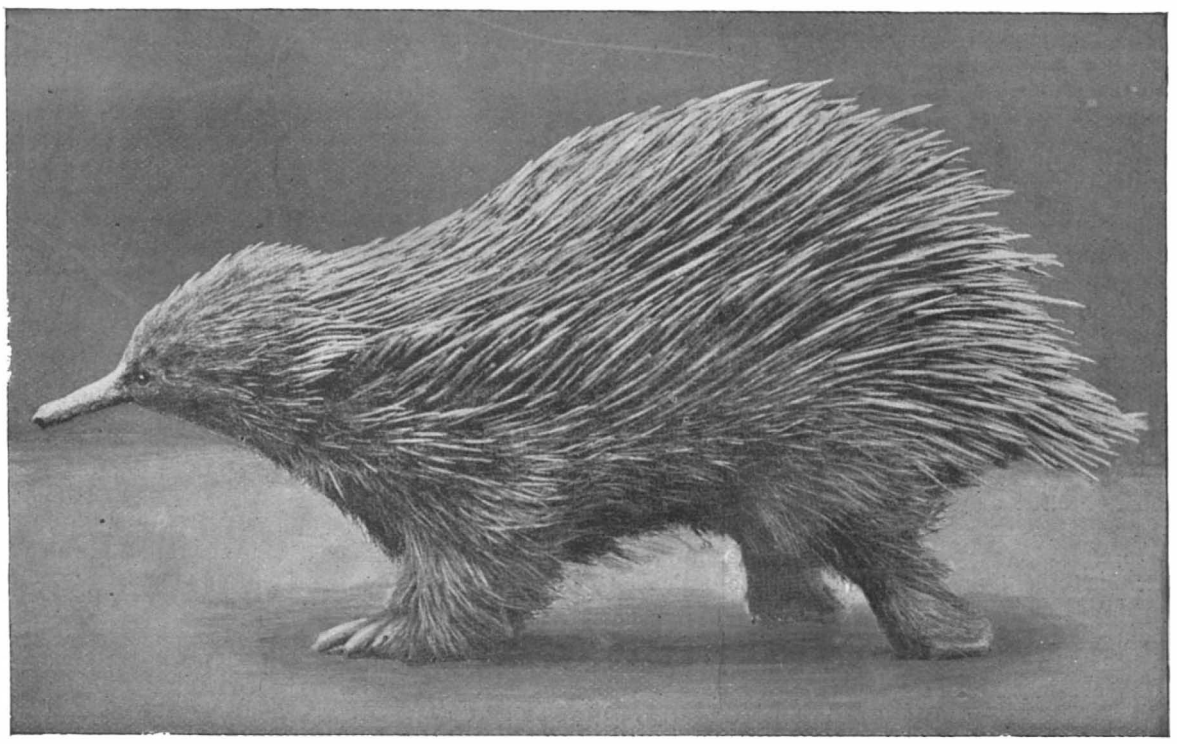
Dangers of Liquefied Air.

M. Raoul Pictet has described the "cold burns" experienced by himself and his assistants during investigations at low temperatures. In some cases the skin is first red, then blue, and subsequently the area of the injured spot extends to nearly double what it was originally. There is a painful itching sensation in the surrounding tissues, as well as at the affected spot, and healing usually takes five or six weeks. In more serious cases the skin rapidly becomes detached, and there is a long and stubborn suppuration, the wound remaining open for more than six months in one instance after a drop of liquid air had fallen on the hand.

BERLIN is one of the most cosmopolitan of European cities. Though it is the capital of Germany, only 37 per cent of its inhabitants are Germans by birth.

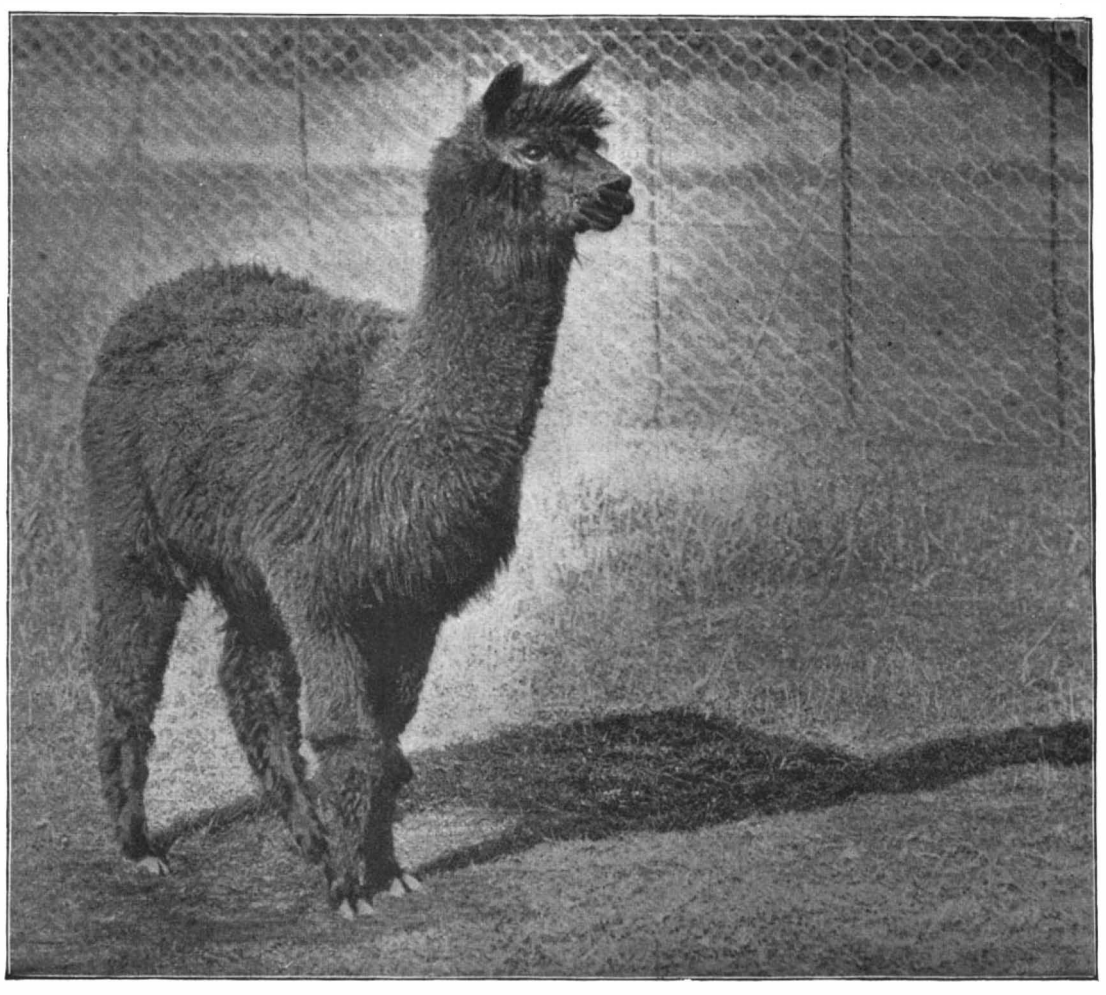
SOME INTERESTING ANIMALS.

The porcupine ant eater is now a very rare animal. Its common name is inappropriate, as it is neither a rodent like the porcupine nor an edentate like the ant eater. It is properly known as echidna (Cuv.) and belongs to a genus of marsupial mammals of the section monotremata. The echidna inhabit Australia and Tasmania. The snout is long and slender, the tongue is protractile, there are no teeth in the jaws, but the palate is provided with several rows of horny spines, and the tongue is furnished with a number of small warts. The best known species is probably the Echidna aculeata, which is about a foot long, with a stout body, powerfully built and especially adapted for burrowing. The food consists of small insects, as ants, which the animal captures by means of a viscid matter on the tongue, which is secreted by two submaxillary glands. The eyes are small and black. The lower part of the body is covered with coarse hair and on the back are dirty white spines about 1¾ inches long. When the animal is attacked, it can sink into loose sand so that only its spines are visible. In sleeping and when irritated they roll themselves into a ball with the head between the forelegs. In captivity they are stupid and move slowly, avoiding the light.



THE ECHIDNA, OR PORCUPINE ANT EATER.

The alpaca is a species of the genus Llama. The alpaca abound in the mountainous regions of Peru, where they subsist on the coarse and scanty forage which grows on the sterile soil of the mountains. The animal is chiefly interesting on account of its wool, the upper part and sides of the body being covered with light chestnut brown wool, which is very soft and is almost as fine as that of the Cashmere goat. The shearing of the wool takes place at irregular intervals, and from ten to twelve pounds of wool are obtained from each animal at each shearing. On the forehead is stiff, silky hair.



THE ALPACA.

Force Exerted on the Bicycle.

A French scientist has recently made some experiments which show the amount of force developed by some of the bicycle experts in a hard race. Windle and Zimmerman have maintained for two minutes a speed to continue which required the expenditure of energy representing two-thirds of one horse power. For six seconds they were able to exert the astonishing force of one and a fourth horse power. This is equivalent to raising a weight of 188 pounds one yard high in one second. This is a conservative estimate, owing to the insufficiency of the coefficients of power used in making the calculations.

Experiments are also being made to determine the force exerted by different sports. These results will be of use for training and as hygienic data. One of the discoveries made during the calculation of the force exerted by bicyclists is that at high speeds the work of a bicyclist in covering a specified distance is as great as that of a man running the same distance. At a moderate speed a runner undergoes three times the labor of a bicyclist, but the higher the speed, the nearer are their exertions equalized.

A GREAT photographic camera for taking full length life size portraits has been made and used with much success by Werner & Son, Dublin. The camera takes a plate 7 feet high and 5 feet wide.

A Phonograph Voice.

Away out in the extreme northwestern part of the city, near the Milwaukee railroad tracks, Silas Leachman puts in four or five hours every day singing at the top of his lungs, though not a soul is in hearing but his wife. When he gets tired of singing he varies the proceedings by preaching a negro sermon, or gives an imitation of an Irish wake, and altogether conducts himself in a way that would lead the neighbors to consider him a fit subject for a lunatic asylum—if there were any neighbors, but there are not. This is the very reason Mr. Leachman chose the lonely spot for his residence. No one ever goes out there to hear him sing, and yet he is getting rich at it. He earns something over $50 every day, though he never sees one of his auditors.

Mr. Leachman sings for phonographs, and, as he has a monopoly of the business in the West, he contrives to keep busy, and has even been heard to express a wish that he were twins. He has better protection in his monopoly than a copyright or an injunction or unlimited legal talent could afford. Nature gave him the peculiar qualities that enable him to reproduce his voice perfectly on the wax cylinders. Hundreds of people have attempted to break in on his profitable monopoly, but the results of their efforts put an effectual stop to their attempts. And so Mr. Leachman goes on enjoying the monopoly and reaping the profits thereof.

There are four other men in the East that also do work for the phonograph, but while they have to have a man to play the piano while they sing, another to make the announcement, another to change the cylinders, and a fourth to keep the machines in order, Mr. Leachman is the entire show in himself. Furthermore, he can give an unlimited number of impersonations, while the other four men are limited to a few specialties each. Mr. Leachman is a natural mimic, and therein lies the secret of his success. He sings ballads, negro melodies, and Irish, Chinese, and Dutch dialect songs. He plays his own accompaniment on the piano and takes care of the machines. He prepares three "records," as the wax cylinders are called, at one time. To do this three phonographs are placed near the piano with the horns at one side pointing away from the keyboard at an angle of 45 degrees. The horns have to be placed very carefully, for a fifth of an inch makes a great difference in the tone the cylinders will reproduce.

When the horns have been adjusted exactly right Mr. Leachman seats himself at the piano and, turning his head away over his right shoulder, begins to sing as loud as he can, and that is pretty loud, for he is a man of powerful physique, and has been practicing loud singing for four years. He has been doing this work until his throat has become calloused so that he no longer becomes exhausted after singing a short time. As soon as he has finished one song he slips off the wax cylinders, puts on three fresh ones without leaving his seat, and goes right on singing until a passing train compels him to stop for a short time. In the four years he has been in the business he has made nearly 250,000 records. So great is the demand for them that he cannot fill his orders. It is such exceedingly hard work that he cannot sing more than four hours a day. He gets 35 cents for every cylinder he prepares. He has a repertoire of 420 pieces, and his work is put on the market under a score of names. He has a remarkable memory, and after once hearing a song can not only repeat the words and music correctly, but he can imitate excellently the voice and expression of the singer.—Chicago Daily Tribune.

The Liquefaction of Hydrogen.

Under the combined influences of great pressure and intense cold, hydrogen has at last surrendered and been liquefied. The means by which this has been effected have, of course, been at the disposal of the physicist and chemist for many years, but Professor Olszewski, of Cracow, who, it may be remembered, also liquefied argon and examined its properties, has been the first to succeed in obtaining liquid hydrogen in tolerable quantity, since he has been able, we learn, to give two constants in regard to it. Thus it is announced that its critical point—the temperature at which it passes from a liquid to the condition of vapor—is —233° C., and its boiling point at normal pressure is —243° C. It is well known that hydrogen has hitherto most strenuously resisted all attempts at liquefaction, and the fact of its obduracy in this respect, though in other respects it is most tractable, having now been overcome, removes the only gaseous element known to us which has not been liquefied. Until, therefore, more attenuated gases even than hydrogen are added to the list of chemical simplicities, no further discoveries on this particular line of research can be hoped for.—Lancet.

The English Sparrow.

State Entomologist Lintner opposes a bill now before the New York Senate providing for a bounty of one cent on each English sparrow killed. While the English sparrow is an unmitigated nuisance, and there can be no question of the desirability of its extermination, he nevertheless deems this bill highly inexpedient, for the following reasons:

"There are other methods by which the pest could be better reduced in number, as by repealing all laws that give it protection; by outlawing it and making it a misdemeanor to give it shelter or food; by protecting the butcher bird, the sparrow hawk, and the screech owl, which feed largely upon it; by making it the duty of game constables and persons to destroy it in cities where the use of firearms is prohibited; and by a concerted action of the people for its destruction.

"The extermination of the sparrow is an impossibility. Could it be done in any one State, a few years would again fill it from adjoining States. Nor is it possible largely to reduce its numbers through State legislation and aid. It is estimated that there are at least fifty millions of English sparrows in the State of New York. To reduce this number within five years to twenty-five millions through the payment of bounties large enough to insure it, millions of dollars would be required. As soon as the bounties were withheld, the rapid propagation of the sparrow would quickly restore the original number—limited only by the food supply.

"A one cent bounty in the State of Michigan, paid for one year, secured the destruction of only 31,000 sparrows—a number so small that if they had all been killed in the city of Detroit it would not have made a noticeable difference. So far as beneficial results are concerned, the money paid was actually thrown away—and worse than thrown away.

"A bounty would result in serious harm to agricultural interests. It would only be profitable to destroy the sparrows in cities. They do not infest the rural districts, unless driven out, for want of food or otherwise, from the cities and large villages. It is a timid bird, and the inevitable result of its being hunted in cities would quickly drive it for safety into the country, where it would become exceedingly destructive in grain fields, while extending its distribution. In the neighborhood of London, England, through its depredations in grain fields, entire crops have been left uncut.

"Under a bounty, in the country particularly, large numbers of our native song sparrows, which are all very valuable from their feeding almost entirely on insects, would be killed, as was the case in Michigan. The average town supervisor, who orders the payment of the bounty, would not be able to discriminate between these and the English sparrow, and the State would be paying money for the protection and multiplication of injurious insects.

"The offer of a bounty would be responded to mainly by boys. Its effect could not but be injurious to them, while their careless shots would endanger the lives of others."

Development of the Coal Tar Dye Industry.

At a recent meeting of the New York section of the Society of Chemical Industry the chairman presented in abstract a paper on above subject by F. J. Schoellkopf, Jr.

The author said the cause of the slow development of the aniline color industry in this country was to be found in the wonderful rapidity with which it developed in Germany after it had once fairly got under way. Aniline colors were first made in France, while the tar whence they were derived was made in England. Later the manufacture of the dyes themselves was taken up in England. Germany, however, gradually came to the fore, attaining undisputed supremacy in the manufacture in 1862. The rapid growth of the industry in early years is shown by the following figures cited by the author. The value of the aniline colors produced in Germany in 1874 was $6,000; in 1878, $8,000; and in 1882, $72,500.

This rapid growth absorbed all of the ability in the line of chemistry which was produced. There was immediate and profitable employment in Germany, for all the chemists who had any knowledge of anilines. About 1880, however, the supply of coal tar chemists turned out by the universities exceeded the demand for home consumption, and, the home markets becoming glutted, they turned toward America for a field. Magenta was for a long time the only aniline dye made in America, it having been already made here for ten years. In the years 1882 and 1883 nine aniline plants were established in America. The prosperity of the new industry lasted until the passage of the tariff act of 1883, which abolished the fifty cent specific duty and left only a nominal duty of fifteen per cent ad valorem.

Within one year five of the factories had to go out of business. But the hope of a more prosperous future, combined with their large investments, kept some of the factories from discontinuing operations.

The writer then reviewed the effects of the tariff changes on the industry. The reasons for the lack of financial success on the part of aniline makers in this country he ascribed, first, to the higher wages paid in America, which is one hundred per cent more than in Germany; the greater cost of the plant (fifty per cent more than in Germany), and of the raw materials (twenty-two per cent more than in Germany).

A number of tables were then given showing the cost of raw materials used as compared with the cost in Germany.

In the discussion which ensued it was brought out that since the paper was prepared numerous changes had occurred in the commercial conditions which would affect the figures given in the various tables. They will, therefore, be revised before publication.

Dr. Schweitzer differed from the author as to the principal conditions militating against the American producer, and named as one of the main factors the difficulty in obtaining satisfactory labor of the kind needed. He said: "You cannot get a laborer here who can make a proper observation of a thermometer or stir the contents of an evaporating pan. A lad of sixteen will do there what we have to hire a Columbia College graduate to do."

Anæsthesia in the Lower Animals.

Not very long after the introduction of chloroform as an anæsthetic into medical practice, and when its beneficent and pain-suppressing powers had been fully demonstrated on mankind, inquiry began to be made as to why its merciful influence should not be extended to the domestic animals when they had to undergo painful operations. especially those of a protracted kind; and we remember, says the editor of the Lancet (London), reading a most eloquent appeal for its employment in the case of the horse in a clever little book, published nearly forty years ago, by Sir Francis B. Head, entitled "The Horse and his Rider." This appeal is perhaps as necessary now as it was when first made, and certainly it should be brought again to the notice of those who, for some reason or other, do not resort to anæsthesia, general or local, when plying the cutting instrument, the burning iron, or other pain-producing agent on animals. In the section of his book on chloroforming horses, after dwelling on the unspeakable boon that had been conferred on man by the application of anæsthetics in the abolition of suffering and agony, he says: "Now, if in return for this extraordinary alleviation, or rather annihilation, of all sufferings under surgical treatment, man should deem it his duty to render thanks to that Omnipotent Power from which it has proceeded, is it possible for him practically to perform any more acceptable act of acknowledgment than to allow the dumb creatures in his service to participate in a blessing which, by divine authority, has been imparted to the possessors, not exclusively of human reason, but without favor or exception of animal life? As regards his horses, the performance of this duty is especially incumbent; for not only, like all other animals, are they liable to the accidents and ills that flesh is heir to, but some of the cruelest operations to which they are subjected—such, for instance, as cutting off and cauterizing their tails, burning their sinews with red hot irons, dividing and cutting out a portion of a nerve (sensory), with other excruciating operations on young horses, under which they are often heard to squeal from pain—are inflicted on them to comply with either a useless as well as a barbarous fashion; or to enable them 'to go for another season's hunting;' or for the attainment of conveniences of which the horse derives not the smallest share; or to make them 'sound enough to sell;' and as the high bred, broken down hunter has no voice to ask for mercy, as he cannot boast of possessing reason, or as he has inherited no knowledge, as he has no power to bequeath any, as his whole energies have been devoted to the service and enjoyments of man, by whose mechanical contrivances he is now 'cast' with his four feet shackled together, lying prostrate on a heap of straw, just before the red hot iron sears his overstrained sinews or the sharp knife is inserted into his living flesh—surely in a civilized country like England some high power should be authorized to exclaim, not 'Woodman, spare that tree!' but 'Sportsman, save that horse!' by chloroform from the agonizing torture to which you have sentenced him. You are a man of pleasure—save him from unnecessary pain. You are a man of business—inscribe in that ledger in which every one of the acts of your life is recorded, on one side how much he will gain and on the other, per contra, how very little you will lose, by the evaporation of a fluid that will not cost you the price of the shoes of the poor animal whose marketable value you have determined, by excruciating agony to him, to increase."

This urgent appeal concludes with another allusion to the benefits chloroform has conferred on the human species, and adds: "If, therefore, man to this enormous extent is benefited by chloroform, what 'right has he to withhold it from his own animals, to whom, not only in equity, but by the laws of God, it belongs as much as it belongs to him? Their claims are so affecting and so obvious, the remedy that would save them from all pain is so cheap and simple, that we feel it is only necessary to appeal to the public to obtain by acclamation a verdict in their favor."

Notwithstanding this and similar appeals and remonstrances, the employment of anæsthetics has made slow progress in veterinary practice, expense, trouble, and time being usually the pleas offered for their non-adoption. A number of veterinary surgeons, however, resort to them on every possible occasion, and, putting the avoidance of pain on one side, testify to the advantages they derive from them; indeed, there are some operations which could not be attempted with any hope of a successful result unless the animal is under the influence of an anæsthetic. Even in cases of difficult parturition, partial anæsthesia, especially in the mare, is found to be most advantageous in effecting delivery. Of all animals the horse is the one to which chloroform can be most safely administered; in fact, it is sometimes an arduous task to destroy this creature by inhalation of the drug. It has been given to hundreds—it might be said thousands—of horses, almost undiluted with air, and with absolute impunity. But some veterinary surgeons imagine that there may be danger in this rapid anæsthesia, and advise the mixture of chloroform and air, which, if it requires a longer time to produce the necessary degree of narcosis, is safer. However this may be, it is gratifying to find that attention is being increasingly directed to this matter; and among those who have distinguished themselves in this direction, and have labored to dispel the prejudice which still opposes the use of chloroform, must be named Mr. Wallis Hoare, F.R.C.V.S., Cork, who, in advising the dilution of chloroform vapor with air during inhalation, has improved on the ordinary apparatus by a modified bag and foot bellows, which appears to be easily worked and effective. For adult horses the quantity of chloroform required in this apparatus is from one and a half to two ounces, the time occupied in producing complete anæsthesia varying from ten to fifteen minutes, and Mr. Hoare regards loss of muscular power in the limbs and loss of sensation on striking the animal firmly on the quarter as the best indications of the proper stage at which operations may be commenced. Mr. Hoare is evidently an enthusiast in this humane practice of veterinary surgery, and it is earnestly to be hoped that his example may be largely followed; for though all animals should receive merciful consideration when they have to undergo operations, surely none of them is more entitled to this than the horse, whose muteness under the infliction of pain seems to lead people to think that he suffers but little—a grave error, but one which has caused him to be more abused and tortured than all the others put together.

A Canine Life Saver.

In the March number of Our Dumb Animals, Boston, Mass., the following account of how a dog was instrumental in saving the lives of eight seamen is given:

"Some years ago a vessel was driven on the beach of Lydd, in Kent, England. The sea was rolling furiously. Eight poor fellows were crying for help; but a boat could not be got off, through the storm, to their assistance, and they were in constant peril, for any moment the ship was in danger of sinking. At length a gentleman came along the beach accompanied by his Newfoundland dog. He directed the animal's attention to the vessel, and put a short stick in his mouth. The intelligent and courageous dog at once understood his meaning, sprang into the sea and fought his way through the angry waves toward the vessel. He could not, however, get close enough to deliver that with which he was charged; but the crew understood what was meant, and they made fast a rope to another piece of wood and threw it toward him. The noble animal at once dropped his own piece of wood and immediately seized that which had been thrown to him; and then, with a degree of strength and determination scarcely credible—for he was again and again lost under the waves—he dragged it through the surge, and delivered it to his master. A line of communication was thus formed with the vessel, and every man on board was rescued."

3,000 New Freight Cars.

The New York Central standard box freight car is of 60,000 lb. capacity. Three thousand of these new cars are contracted for. They are to weigh approximately 30,000 lb. each.

The general dimensions are slightly greater than the average new box cars. The inside dimensions are 34 feet 4½ inches by 8 feet 3½ inches, and the clear height is 7 feet 1¼ inches. The appliances named and specified in the contracts made for these cars, are, viz., Gould couplers, Fox trucks, Dunham door fixtures: Kimball turnbuckles, McGuire grain doors, Vose springs, Westinghouse air brakes, and the New York Central standard draught gear, steel brake beams and uncoupling apparatus.

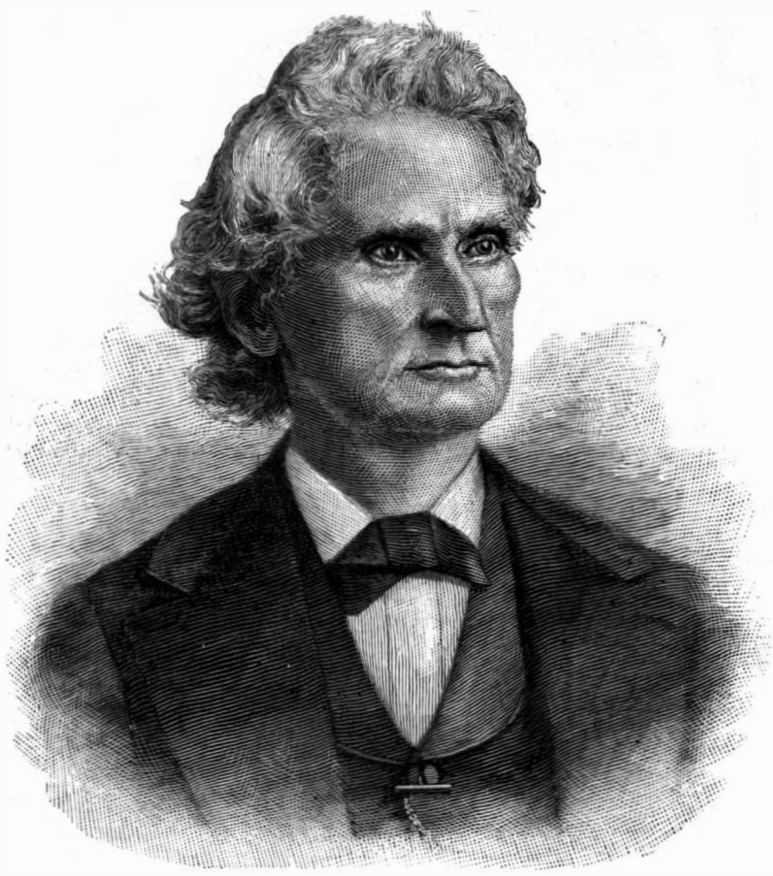
These cars are to be very strongly built, and the end framing has been made especially heavy to prevent bulging and wrecking by bulky freight, which is liable to shift its position.

JAMES D. DANA.

In the death of Professor James Dwight Dana, America has lost one of her greatest scientific men.

The celebrated mineralogist and geologist passed away after an illness of only a few hours at his New Haven home on Easter Sunday, April 14, in the eighty-second year of his age. He was born in Utica, February 12, 1813. His early education was obtained at school in his native place. In the autumn of 1830 he entered Yale College and graduated three years later, after which he was appointed professor of mathematics to midshipmen in the United States Navy. In the two years he held this position he visited France, Italy, Greece and Turkey. In 1835 he returned to New Haven and became assistant in chemistry to Prof. Silliman. He was engaged at this time in the preparation of his "Treatise on Mineralogy," the first edition of which was published in 1837. This work was the first of his remarkable writings which were to mark an epoch in the history of natural science. In 1836 he received the appointment of mineralogist and geologist to the exploring expedition sent by the United States to the Southern and Pacific Oceans. The Peacock, on which he sailed, was wrecked at the mouth of the Columbia River. In the three years and ten months which he spent on the trip he visited Madeira, Rio de Janeiro, Terra del Fuego, Valparaiso, Callao, Tahiti, Samoa, Australia, the Hawaiian Islands, the Feejee group, Manila, Borneo, Singapore, Cape of Good Hope, St. Helena and many other places. Besides the mineralogy and geology of the expedition, Mr. Dana had under his supervision the zoological department, including the crustacea and corals. The rare opportunity which this voyage afforded for scientific observation had been well improved, and for thirteen years after his return he was engaged principally in studying the material that he had collected, making drawings and preparing reports for publication. From 1842 to 1844 he lived in Washington. In the latter year he removed to New Haven, where he married Henrietta Frances, third daughter of Prof. Silliman.

In 1850 Mr. Dana was appointed Silliman professor of natural history and geology in Yale College, succeeding his father-in-law, but he did not enter on the active administration of the chair until 1856. The title of the professorship was changed in 1864. Mr. Dana became associate editor of The American Journal of Science and Arts, and after Professor Silliman's death, its senior editor. Contemporaneously with his duties as a lecturer and editor, Prof. Dana prepared his well known text books on mineralogy and geology. His "System of Mineralogy" grew in size from 452 pages in 1837 to the edition of 1892, which contains 1,197 pages. The "Manual of Mineralogy," a more elementary work, has also a deserved popularity. These books, with his "Manual of Geology" and "Text Book of Geology," are recognized as standards throughout the world, and are used as text books and works of reference wherever the sciences of which they treat are taught in the English language. His writings on the coral islands include "Coral Reefs and Islands" (1853) and a second edition of that book which was published in 1872 under the title of "Origin of Coral Reefs and Islands." His separate papers include hundreds of titles. Many honors were paid to Mr. Dana. He received the degrees of Ph.D. and LL.D. The Geographical Society of London conferred on him its Wollaston medal in 1872, and in 1877 he received the Copley gold medal from the Royal Society of London. He was also a member of the chief scientific societies of America and Europe. Prof. Dana retired from active work at Yale two years ago, but has given private lectures and instructions at his home and gave invaluable advice on the subject of geological and zoological matters in the Peabody Museum.



James D. Dana

Rare Metals and Alloys.

A glass case, said to be worth $50,000, was one of the attractions at the London Royal Institution recently. The contents were a variety of globules and cast bricks of unpretending appearance, used to illustrate Professor Roberts-Austen's lecture on the rarer metals and their alloys. A slab of palladium, the largest in the world, was valued alone at $35,000. Professor Moissan in France and Mr. Claude Vautin in England have, by different methods, succeeded in reducing and casting these highly infusible metals, most of which have hitherto been seen only in minute and precious fragments; but whereas M. Moissan with his electric furnace has never succeeded in eliminating carbon from his products, which are, therefore, really carbides, Mr. Vautin, by the ingenious use of finely divided aluminum as a reducing agent, can produce large quantities of almost any one of the metals from their oxides in an absolutely pure condition. The value of these metals, even if they could all be produced commercially on a large scale, is still doubtful, although indications of their usefulness are not wanting. Chromium, for instance, has made a revolution in steel projectiles, while aluminum threatens to become a popular craze. The experiments conducted at Woolwich, under the supervision of the ordnance director, show, moreover, what we may expect from these metals with high fusing points the peculiar power they possess of strengthening other metals.

House Nerves—A Bad Ailment.

Energetic, care-free individuals laugh at the suggestion of such an ailment as house nerves and say it is only imaginary. But thousands of women, says the New York Press, will testify otherwise.

People of sedentary habits, who spend all their time indoors, frequently become morbid, brooding and irritable. The failure of any member of the family to reach home at the usual time brings forth gloomy forebodings of disaster. The absence of any one at night causes floor walking, and tears, even though such person be of mature years, sound health, and abundant ability to care for himself. A projected journey is overcast by recitals of horrible accidents. Meals are unsatisfactory, clothes never fit, no one sympathizes or condoles with the sufferer.

The reasons of house nerves are legion. Introspection is one. Let a woman sit at home day after day, week in and week out, and analysis of everything and person within her ken naturally follows, herself included. A woman who studies herself, her wants and desires, her ailments and loneliness, is on a fair road to an asylum, did she but know it.

Some women, it is true, are tied down by children and household cares to a ceaseless indoor life, but they are not generally the ones who succumb to house nerves, one reason being that, forced out of contact with others, they yearn always for the privilege of mingling in some sort of society, embracing every chance thrown in their way toward that end. But the woman who stays at home because she might get sick by venturing out in the cold or because her neighbor can entertain better than she can or dress better, or perhaps the habit has become fixed by degrees to that extent that it is like parting with a tooth to get out of the routine—this is the woman who broods and fancies and cries over mental pictures of catastrophes that never happen and meets troubles which never come.

Any parent who owns a highly imaginative child owes it to society at large to throw it in with healthy, merry companions, who always effect a complete cure, for mirth is infectious. But if the unhappy owner is repressed and kept indoors, some family in the future will feel the effects.

The cure is simple, but few follow it. Throw away your medicine and go visiting. Patronize all the gayeties that your pocketbook affords. Take long walks in the sunshine, and whenever a morbid thought comes think up a necessary errand, and it will dissolve like mist before the sun. House nerves can be cured, but only by natural laws. Medicines dull, but do not cure.

Protection Against Rust.

In La Revue Scientifique a description is given of Gesner's method of protecting iron and steel against rust. The method consists in forming on the surface of the metal a double carbide of hydrogen and iron, which is extremely hard and adherent. In fact, a bar thus coated can be bent through an angle of 45 degrees without disturbing the layer. In carrying out the process, the articles are thoroughly cleaned from rust, but it is not indispensable to remove all oil or grease. A couple of gas retorts are placed alongside each other and raised to a temperature of from 600 degrees Centigrade to 700 degrees Centigrade. The articles to be treated are then placed in these retorts for about 20 minutes, after which a current of hydrogen is passed through the retorts for 45 minutes. A small quantity of naphtha is then introduced, the supply being maintained for 10 minutes. It is then stopped, the current of hydrogen being kept up 15 minutes longer, when it is stopped and the retorts allowed to cool to 400 degrees Centigrade, and when this temperature is reached the doors can be opened and the finished product removed. The coating thus given has a bluish color.

In a communication to La Societe d'Encouragement, M. Charpy gives the results of a research on the hardening of steel, on which he has been engaged some time. The two points toward which his investigations have mainly been directed are, first, to ascertain what relation there may be between the phenomenon of recalescence and the variation in the mechanical qualities of the metal by bending. In the second place, he wished to determine what was the significance of Osmond's "critical points," a_2 and a_3, which occur in iron at about 745 degrees and 860 degrees, respectively. The metal used was four samples of open hearth steel, having respectively 0·11, 0·35, 0·45 and 0·75 per cent of carbon. Twelve special steels were also specially prepared for the research, making use of extremely pure materials. The first four of these twelve were carbon steels, containing respectively 0·09, 0·06, 0·37 and 0·65 per cent of carbon. Another four samples were of extra soft steel containing in addition about 1 per cent of either chromium, manganese, nickel or tungsten. The remaining four were of a harder steel, having 0·45 per cent of carbon and about 1 per cent of some one of the elements already mentioned. The cooling curves of all these metals have been obtained automatically by the use of photography. After this, specimens of each of the metals enumerated were hardened in oil or water, the experiments being repeated in varying the temperature from which the metal was cooled. For heating the specimens preparatory to this an electric furnace was used, the requisite temperature being obtained by passing a current through a platinum spiral. This plan prevented any risk of contaminating the samples. The temperatures were taken with a Le Chatelier pyrometer. The physical characteristics of the different samples, after tempering, were ascertained by tensile bending tests and drop tests. Briefly stated, the results seem to show that only near 700 degrees Centigrade, the a_1 point, do the properties of the metal, so far as tempering is concerned, undergo a change, being unaffected at the critical points a_2 and a_3. Nevertheless, the change in the metal which occurs at the a_2 point seems to be the same as occurs at the breaking down point in a tensile test, and to also be the critical point so far as magnetic properties are concerned. In every case hardening increased the breaking load, both in tension, compression, and drop tests, but the elongation diminished.

The Useful Donkey.

It seems that Mr. Shepherd has a very rich mine in an almost inaccessible part of the Mexican mountain ranges, a long way removed from any railroad, which he has been equipping at great cost with first class mechanical appliances. Some time ago Mr. Shepherd concluded that his equipment required 5,000 or 6,000 feet of wire rope for carrier purposes, but how to get it up into his mountain fastness in a single piece, as required, was a question. By no possibility could it be moved from the railroad to final destination on wheels, and he didn't see how it could be carried by burros. But a Mexican did. He explained his plan, got the contract for carrying the 1¼ inch cable, and successfully executed it. Here is the way he did it. He coiled the rope up at fixed distances along its entire length, each coil being of approximately the same size and designed to weigh 300 pounds, and loaded it on a string of burros with proper fastenings. To take up the slack between each two burros, two Mexicans with padded shoulders were inserted and faithfully kept up their end, or rather portion, of the line. The procession was a curious one, to be sure, but it got there just the same.

Colocynth Apples.

United States Consul Wallace, of Jerusalem, Palestine, has made an interesting report to the State Department at Washington, under the date of January 25, in which he describes the growing of the colocynth plant, and makes some interesting suggestions as to its cultivation in the United States.

The colocynth, or bitter apple, he says, grows abundantly on the maritime plain that lies between the mountains of Palestine and the eastern shore of the Mediterranean. It is found from below the city of Gaza on the south to the base of Mount Carmel on the north. The dwellers along this plain pay little attention to the plant, and spend neither time nor labor in its cultivation. It grows without cultivation, the soil and climatic conditions producing it without the help of the husbandman. With some attention the plant would undoubtedly bear a larger and richer fruit—richer in that pulp which makes the colocynth valuable. But there is no object in thus improving the plant and its yield, as nature alone now supplies far more than the natives can find a market for.

The soil of this maritime plain is a light brown loam, very rich, and almost without a stone. In places where the loam has been mixed with sand the colocynth plant seems to thrive best. Very little rain falls on parts of this plain. The plant does not suffer from this lack of moisture. The climate is warm the year round, and during the summer months the heat is intense; so that the conditions necessary for the successful raising of the colocynth would seem to be a good soil, somewhat sandy, a warm climate and little moisture.

The plant itself resembles our common cucumber, but its fruit is globose, about the size of an orange, of a light brown color. Its rind is smooth, thin and parchment-like. It is known as the Turkish colocynth, and is superior to the Spanish and Mogador varieties in the amount of pulp its fruit contains. The pulp constitutes 25 per cent of the fruit. The rind and seeds are valueless.

The fellaheen or peasants gather the fruit in July and August before it is quite ripe. It is sold to Jaffa dealers, who peel it and dry the pulp in the sun. It is then moulded into irregular small balls, packed in boxes and shipped, mostly to England. The average annual shipment from Jaffa is 10,000 pounds, though last year's shipment amounted to only about 6,000 pounds. The quantity could be increased indefinitely if there were more demand for it and a price were paid that would make it an inducement for the peasants to gather and prepare it. The price now paid for the colocynth pulp, prepared, packed for shipment and delivered on the steamers in the port of Jaffa is about 30 cents a pound.

There seems to be no reason why the plant should not be successfully grown in certain parts of the United States. The soil and climatic conditions are certainly adapted to it.

Handling the New Firearms.

The Adjutant-General has issued the following directions:

Owing to the great amount of heat developed during firing, care must be exercised in the handling of the new arm, United States magazine rifle, cal. 0·30, model 1892.

After fifteen rounds fired rapidly (ten or more a minute) the piece should be handled only by the stock, hand-guard, or metal parts in rear of the chamber, as the barrel becomes uncomfortably hot about this time, though the rear sights and bands will not be found so until from thirty to thirty-five rounds have been fired.

In slow firing (at the rate of three or less a minute) the barrel of the piece should not be handled after from seventeen to twenty rounds.

After forty rounds fired at this rate, handle the arm only by the wooden parts and those metal parts in rear of the chamber.

If the leaf of the rear sight is raised during this firing (as it probably would be), the sight can be adjusted, if done quickly, even after a hundred rounds, without fear of burning the hand.

Two hundred rounds, probably the maximum amount to be carried by any soldier, or even as many as he can possibly carry, can be fired rapidly without injury to the arm, other than the charring of the wooden parts in contact with the barrel.

If it be necessary or desirable to cool the barrel more rapidly than it would when exposed merely to the air, remove the bolt, depress the muzzle until nearly vertical, and pour in water very slowly at first, until steam is no longer formed, when it can be poured rapidly.

In service the canteen or cup could be used for this purpose.

Owing to the large amount of water necessary to cool a heated rifle, from four to six quarts being required, artificial cooling would not ordinarily be practicable in the field.

There is little to be gained, even if employed, as after two hundred rounds one can handle the piece by the stock without burning the hand.

The soldier will soon learn to handle the piece carefully after any firing, no matter how little, and artificial cooling by water should not ordinarily be practiced, as it may prove injurious to the barrel.

The barrel of the Springfield rifle, caliber 0.45, using black powder, becomes too hot to handle (above the lower band) after about thirty rounds fired at the rate of seven a minute. In other words, it appears to take twice as many rounds in the old rifle as in the new, to bring the barrel to about the same temperature.

Until further orders the following spare parts only will be issued to companies to be kept on hand for the repair of the United States magazine rifle and carbine: main springs; magazine springs; sear springs; cut-off springs; stocks.

In case of damage to other parts of the rifle, such parts—if they can be detached without further injury to the arm—will be sent, properly marked for identification, to the commanding officer, Springfield Armory, with a statement of the circumstances under which the damage was incurred. If found advisable, the damaged parts will then be ordered replaced.

Company commanders should exercise a careful supervision of all dismounting and assembling of the arm, particularly in cases where any part is injured. The authorized dismounting and assembling by soldier, described in the rules for the management of the rifle, should be confined to what is necessary only for instruction under proper supervision, or for the necessary cleaning of the arm.

Demagnetization of Watches.

A simple method is as follows: A strong magnet is placed in a horizontal position—on a table, for instance—and the watch held horizontally about half a yard off on a level with the magnet. The watch must then be brought slowly nearer the magnet, while being turned slowly, and at the same time as regularly as possible, between the fingers, as on a vertical axis. When the poles of the magnets are reached, the turning of the watch is to be continued while being gradually withdrawn until the starting point is reached.

Instead of turning the watch with the fingers, it may be done by fastening it to a twisted string, as illustrated in our SUPPLEMENT, No. 782.

RECENTLY PATENTED INVENTIONS.

Engineering.

FEED WATER HEATER AND PURIFIER.—Daniel M. Robinson, Bay City, Mich. Connected with the boiler, according to this invention, is an outer shell or cylinder with water at a common level with that of the boiler, a settling cylinder within the outer shell having transverse partitions, an inlet pipe entering its bottom and a discharge pipe opening from its top, and a corrugated cylinder receiving the discharge. The feed water is by this means thoroughly purified before entering the boiler, and heated up to the temperature of the water in the boiler proper, the heating being effected by the exhaust passing out through the furnace flue, and the apparatus in no way interfering with the circulation of the boiler

MOTOR.—William H. D. Ludlow, Tecumseh, Neb. A power shaft carrying a master wheel, according to this invention, is driven by spring-controlled drums, there being means for transmitting power from the wheel, a sliding disk adapted for engagement with the arms of a governor and frictional engagement with the governor body, the sliding disk being operated by a brake bar. The motor is of simple and inexpensive construction and adapted to run any light machine. The motor, when running, may be stopped almost instantly without exerting undue pressure upon the springs in the drums.

Railway Appliances.

CAR COUPLING.—John C. Yeiser, Austin, Texas. This improvement comprises a link having foot members on its under face, side portions curved slightly upward toward one end, and the upper face being cut away from a point opposite the foot members toward the curved end portion. The link is designed to remain set in a coupling position at all times, and the inventor writes us of its very successful employment on railroads in Texas, where the conductors report that with this link the couplings can invariably be made from the engine, that curves may be readily rounded with the drawheads only an inch apart, and that the link is safer and stronger than any knuckle or hook coupling.

CONNECTING ROD FOR SWITCHES.—Ferdinand F. Maag, Beaumont, Cal. This improvement comprises a casing from which projects a rod threaded for a portion of its length, there being a coiled spring around the rod between washers in the casing, and a sleeve and nuts on the rod for regulating the tension of the spring. The rod is in a measure spring-controlled and automatic in its action, and may be readily and conveniently adjusted as desired to govern the throw of the switch.

TORPEDO SETTER.—John W. Raynor, Sedalia, Mo. This device comprises a pair of spring arms having oppositely curved free ends with terminal loops, a push plate being held between the arms and actuating a cam mechanism to move them. It is a simple and easily operated device by which a torpedo may be readily fastened to the rail from a rapidly moving train.

Mechanical.

ROLLING MILL.—Arthur Perry, Middletown, N. Y. In this mill there are rollers on vertical shafts on the lower ends of which are bevel gear wheels, gear wheels mounted in adjustable bearings meshing with the gear wheels of the vertical shafts, and there being spring-supported bearings for the upper ends of the vertical shafts. The machine will, at one operation, quickly and accurately roll metal into a bar of the desired shape, rollers having differently shaped grooves being inserted according to the work to be done. The machine is very compact and saves handling of the metal by the operator.

CARPENTER'S BENCH.—Eldridge M. Brown, Greenbank, W. Va. This bench is provided with a slidable plunger and mechanism for working it, there being a laterally extending gage bar hinged to the plunger, a guide for the gage bar and work-holding clips on it. Cabinet and carpenter work may be quickly and firmly clamped and held on the bench, which also has a vise adapted to hold a large range of work.

OILER.—Joseph H. Halladay, Clifton Heights, Pa. This device comprises a fixed spindle on which the wheel revolves, the spindle having an oil feed aperture opening onto the inner surface of the wheel and connecting it at its outer end with a pipe extending downwardly into the oil cup. The invention affords a simple oiler which will uniformly lubricate revolving surfaces, such as in trolley and other wheels, automatically feeding while the parts are in motion, and the feed ceasing as soon as the revolving parts come to rest.

Mining, Etc.

AMALGAMATING AND SEPARATING METALS.—Harold M. Baker, Brooklyn, N. Y. This invention relates to a dry process for separating silver and gold from its containing sand, and comprises the use of an amalgam of quicksilver and iron, which is afterward amalgamated with the gold or silver and then separated from the tailings by suitable magnets. The most essential feature of the invention consists in incorporating with the quicksilver sufficient iron to render the amalgam magnetic, so that the separation may readily take place.

Miscellaneous.

FLOWER DISPLAY STAND.—Albert A. Hirsh, New York City. Although especially designed for the display of artificial flowers, this is a simple and very inexpensive stand, which may also be utilized for showing to good advantage feathers and other articles of a similar nature. The table which forms the top of the stand, and in which are apertures to receive the stems of flowers, feathers, etc., may be adjusted to any desired inclination, and so held without the aid of set screws or other fastening devices, and is also readily fixed at such height as seems best, and when the stand is not in use it can be readily taken apart and packed in small compass. A table of any desired size may be used in connection with the base.

GARBAGE FURNACE.—Alexander Brownlee, Dallas, Texas. This is an improvement on a formerly patented invention of the same inventor, for a furnace with a fire grate and adjacent garbage grate separated from the wall of the combustion chamber by a downward passage for products of combustion, there being beneath the garbage grate a sand box filled with filtering material to permit liquid matter to drain into a filter casing. The arrangement is such that the products of combustion pass directly over and through the garbage, then beneath it and over the contents of the sand box, and back beneath this box, all the smoke and gases from the material being treated and the fuel being entirely consumed.

METALLIC DOOR.—Adolph H. Bobb, New York City. This door is composed of outside and inside sheet metal plates having at their sides and ends flanges connected with each other, each plate also having inwardly projecting panel flanges connecting with a central plate. This door can be inexpensively made to combine great durability and strength with lightness, and the several parts are easily fitted together.

WINDOW BLIND.—Godfrey Neuenschwander, Louisville, Ky. This inventor has devised an improvement in Venetian or slat blinds, whereby they may not only be rolled up, but may be placed to form a waterproof and sunproof awning. There is a guide for the blind at each side of the window, and the guide is hinged at its upper end and formed of sections hinged together, the construction being such that the upper section may be rolled up, exposing the upper section of the window, while the lower portion of the window may be closed or concealed by the lower section of the blind.

BUTTON HOOK ATTACHMENT FOR SHOES, [GLOVES, ETC.—James K. Rogers, Philadelphia, Pa. According to this invention a slide way is made along the inner side of the flap, and a permanently secured button hook has a sliding connection with the slide way, along which the buttoner may be adjusted to operate in connection with any of the buttons, facilitating the ready use of the button hook in buttoning shoes, gloves, etc. The slideway is preferably formed of a tape, while another tape, having sliding connection with the first one, carries the button hook, for which a pocket is provided in the shoe or glove.

SNAP HOOK.—Joseph H. Wittmann, Lincoln, Neb. This is a simple and inexpensive device in which a strongly constructed hook is positively closed by a spring, a trigger being arranged to lock the hook and take off the spring, while, by means of the trigger, the hook may be easily opened when necessary. The tongue is pivoted in a longitudinal recess of the body of the hook, and the trigger is pivoted on the rear end of the tongue.

KNOCKDOWN BOX.—Henry Hawley, Culpeper, Va. This is a box which, when properly set up, is designed to form a strong case for any character of goods, while, when the goods have been removed from it, it may be readily taken apart and compactly folded for return to the shipper. Its sides have external longitudinal grooves between their adjacent edges, and joint pieces secured to the outer faces of the sides have approximately right angular inwardly deflected portions projected into the corner recess, and have interlocking portions within the recess.

ENVELOPE.—Louis A. Rosett, New York City (deceased; Moritz Rosett, executor). This is an envelope especially designed for carrying valuable or registered packages, and has a diagonal joint between its lower flap and side flaps, while the top flap has diagonal edges with tabs projecting in a direction corresponding to the diagonal joints between the lower and side flaps, so that when folded the tabs overlie and extend along the diagonal joints, strengthening and bracing them longitudinally. In sealing, the wax seals are preferably placed on both tabs.

BOTTLE.—John H. Heslin, Brooklyn, N. Y. For valuable liquors and mineral waters, etc., this inventor has devised a bottle which cannot be refilled, to prevent substitution or sophistication, the bottle being inexpensive and permitting the ready outflow of its contents. It has a chambered neck, in which is a valve, there being a series of balls in the chamber above the valve, the balls having grooves to register with a longitudinal rib on the inner wall of the neck above the chamber.

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

NEW BOOKS AND PUBLICATIONS.

OFFICIELLER BERICHT DER K. K. OESTERR. CENTRAL COMMISSION. Vienna. 1894. Vol. II. Pp. 135. 60 plates.

The second volume of the official report of the Austrian commission to the Columbian Exhibition treats on the United States Brewing Industry, and has been admirably prepared by Professor Franz Schwackhofer, of Vienna. The author regrets that the brewing industry of the United States was only represented by its products and a few minor machines which did not give an adequate idea of the tremendous and scientific arrangement as found by the professor in the breweries of the United States. The text is divided in five chapters, treating malting, breweries, brewery plants, refrigerating machines and steam boilers. The plates are large and very nicely executed.

The Coal Mining Catalogue of the Ingersoll-Sergeant Drill Company, of New York, is a well got up book of more than 100 large pages, describing, with ample illustration, the coal mining machinery and appliances manufactured by the company. The construction and operation of their improved air compressors naturally fill a leading position in the book, but there is a good deal also about drills for different kinds of service, about pumps, pipes and pipe fittings, machinery for shaft sinking, etc. Machinery made by this company is now in successful operation in almost every quarter of the world, and wherever mining is carried on its work is recognized as upholding a high standard of efficiency.

SCIENTIFIC AMERICAN BUILDING EDITION.

APRIL, 1895.—(No. 114.)

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Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

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Minerals sent for examination should be distinctly marked or labeled.

(6496) G. H. G. says: 1. Do you know of any substance which could be substituted for the mica burnt away in a commutator when short-circuited, so that when armature is connected it may be replaced in a car at once without having to take commutator to pieces and putting in new section of mica? A. There is no substance that can be used to repair the burnt-out mica. The correct way is to take the commutator apart and insert mica slips. 2. Could a water motor driven by water at 50 to 60 pounds supplied through a ½ inch pipe drive a ⅛ horse power dynamo at 2,700 revolutions, if so could you name the make and price? A. The ⅛ horse power dynamo will require an 8 inch motor, using a ¼ inch jet, using 12 gallons of water per minute and running at 1200 revolutions per minute. The dynamo may be driven at required speed by band or belt. The ½ inch pipe is too small for full effect, the friction of the water will lessen the head. If not over 50 feet long, it should be ¾ inch pipe. If 100 feet or over, 1 inch pipe.

(6497) W. F. C. writes: Will you please explain why the blocks in locomotive wheels are necessary? How can the upward or downward thrust of the drivingshafts produce pounding on the rails unless the contact of the wheels with the rails is broken? Would not the weight of the locomotive prevent this? As the whole machine is independent of the rails, beyond the fact that they have its weight to bear, how can the application of power to the perfectly circular driving wheels have any tendency to break their contact with the rails or produce pounding thereon? If there is anything in this theory, a man ought to be able to get into a basket and lift himself. A. The counterweighting of the driving wheels of locomotives is for the purpose of neutralizing the centrifugal force of the pin hubs, pins, connecting rods and pistons. The pin hubs, pins, link bars, and part of the connecting rods have a continuous centrifugal force which causes compression of the rail or pounding, which is not of the nature of a blow from a hammer, but has the same effect by varying the pressure and thus vibrating the rail. The counterweight is also further increased to partially neutralize the longitudinal motion of the crosshead, piston rod, and piston. Pounding is only a technical name for variation of rail pressure by the revolution of unbalanced driving wheels. The comparison of the man in the basket is not applicable to this case.

(6498) H. W. E. writes: Quite a discussion has arisen here of late regarding as to how the ice in Moosehead and other lakes in Maine disappears in the spring. Some claim that it gradually melts away, and others that after a little it sinks into the lake. A. The ice in the spring seems to become crystalline in vertical needles by the action of the sun and warmth, the condition when it is called rotten ice; the water is drawn into the crystalline structure by capillary attraction, when it is ready to fall apart by the least agitation of wind or wave.

(6499) J. B. says: Would you kindly inform me how to make the composition that is used on insulating tape? A. Pure gum rubber dissolved in turpentine, with the addition of 5 per cent of raw linseed oil. 2. Yellow pitch, 8 parts; beeswax, 2 parts; tallow, 1 part.

(6500) P. A. K. asks how to treat sheep and goat skins to make them soft. A. To tan or taw skins with the hair on for rugs and other uses, first thoroughly wash the skin and remove all fleshy matter from the inner surface, then clean the hair or wool with warm water and soft soap, and rinse well. Take ¼ pound each common salt and ground alum and ½ ounce borax; dissolve in hot water and add sufficient rye meal to make a thick paste, which spread on the flesh side of the skin. Fold it lengthwise, the flesh side in, the skin being quite moist, and let it remain for ten days or two weeks in an airy and shady place, then shake out and remove the paste from the surface, and wash and dry. For a heavy skin a second similar application of the salt and alum may be made. Afterward pull and stretch the skin with the hands or over a beam and work on the flesh side with a blunt knife.

(6501) L. McH. asks why a single cell of primary or secondary battery cannot be constructed to give over two volts or thereabout. A. Because no available reaction involving higher potential has been discovered. None is likely to be. No general reason can be given.

(6502) F. S. says: I would like to ask a question in regard to the mineral rod or dip needle. Is there any such thing that will work? A. The mineral rod is of no practical value. See the SCIENTIFIC AMERICAN for August 20, 1892, for an article on "Unscientific and Scientific Divining Rods," or "Experimental Science," page 801.

(6503) A. J. asks: What can I coat steel with in brazing it that will prevent the solder or brass from flowing where I do not want it? Have tried lampblack and Spanish whiting, but they burn off. A. Try a wash of clay and black lead.

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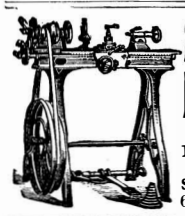

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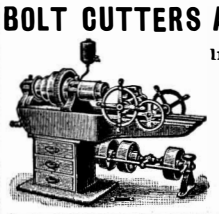

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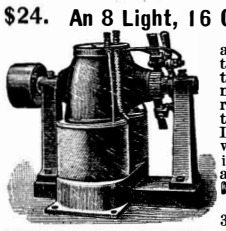

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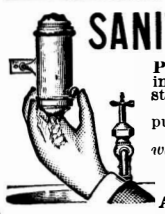

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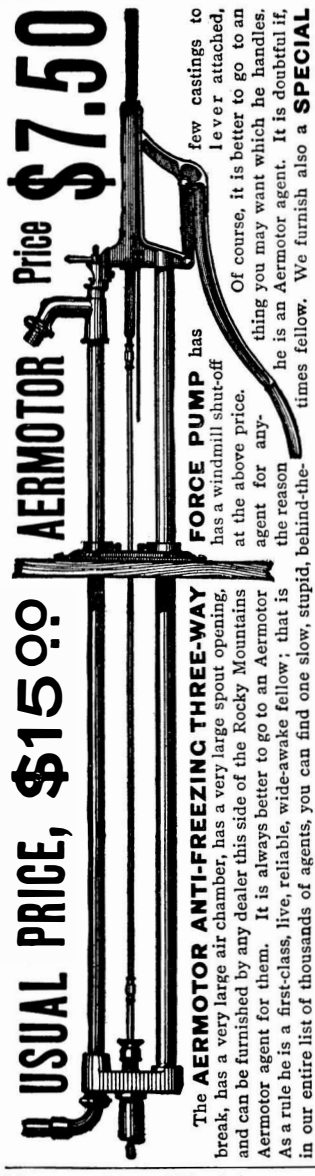

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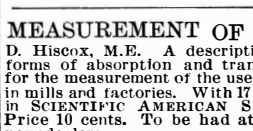

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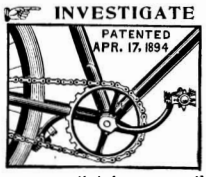

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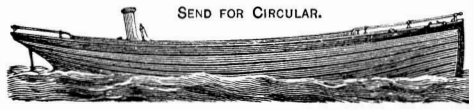

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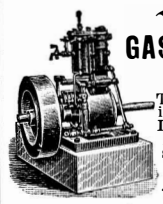

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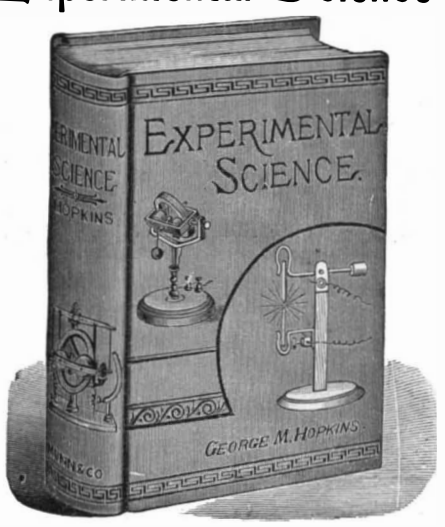

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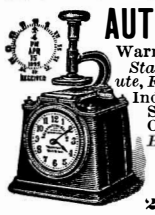

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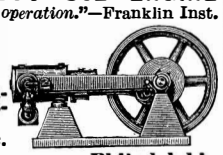

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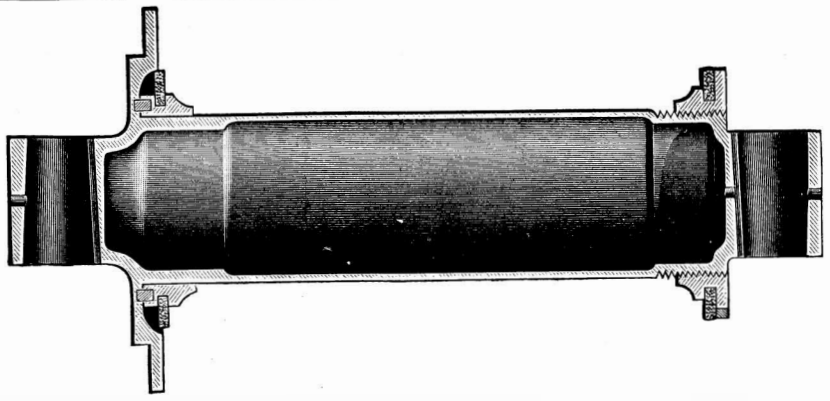

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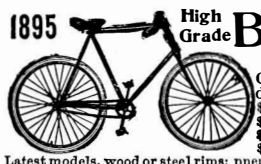

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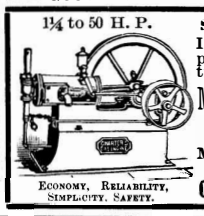

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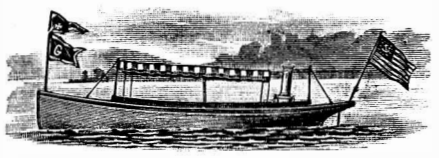

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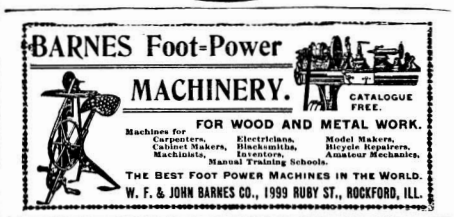

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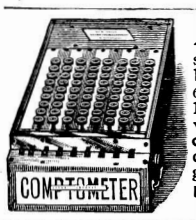

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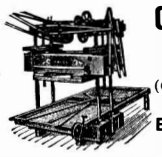

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