SCIENTIFIC AMERICAN

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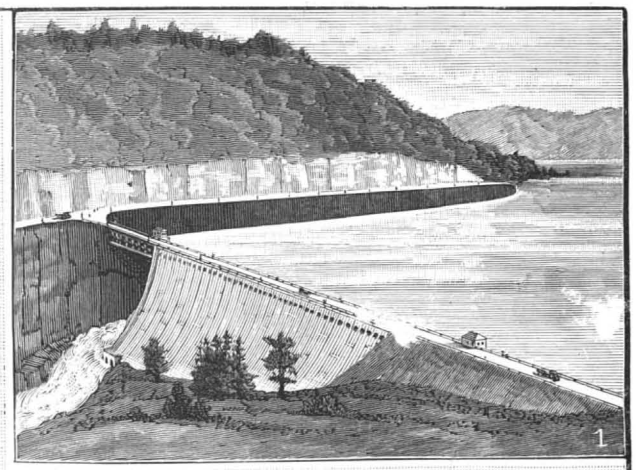

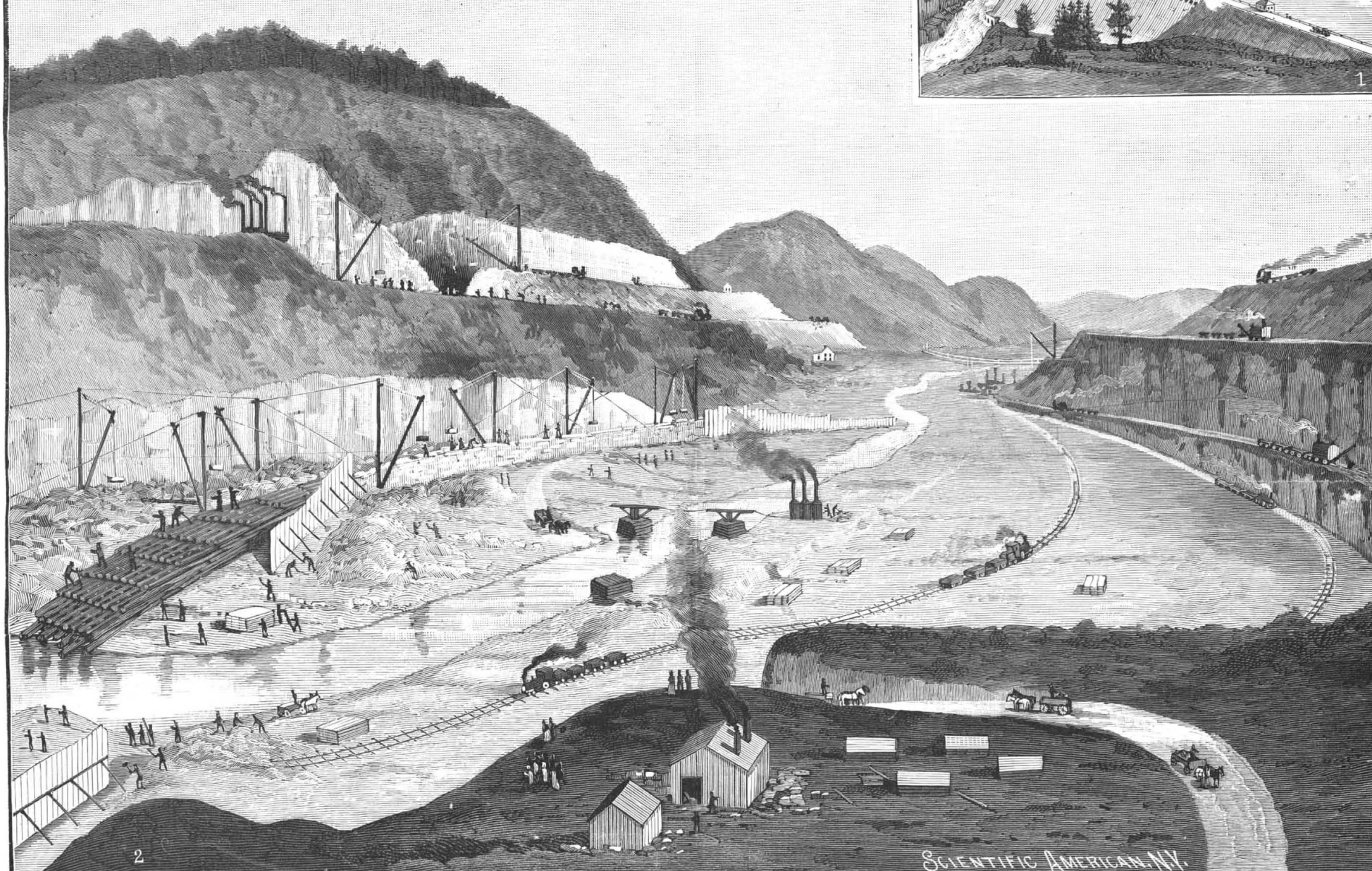

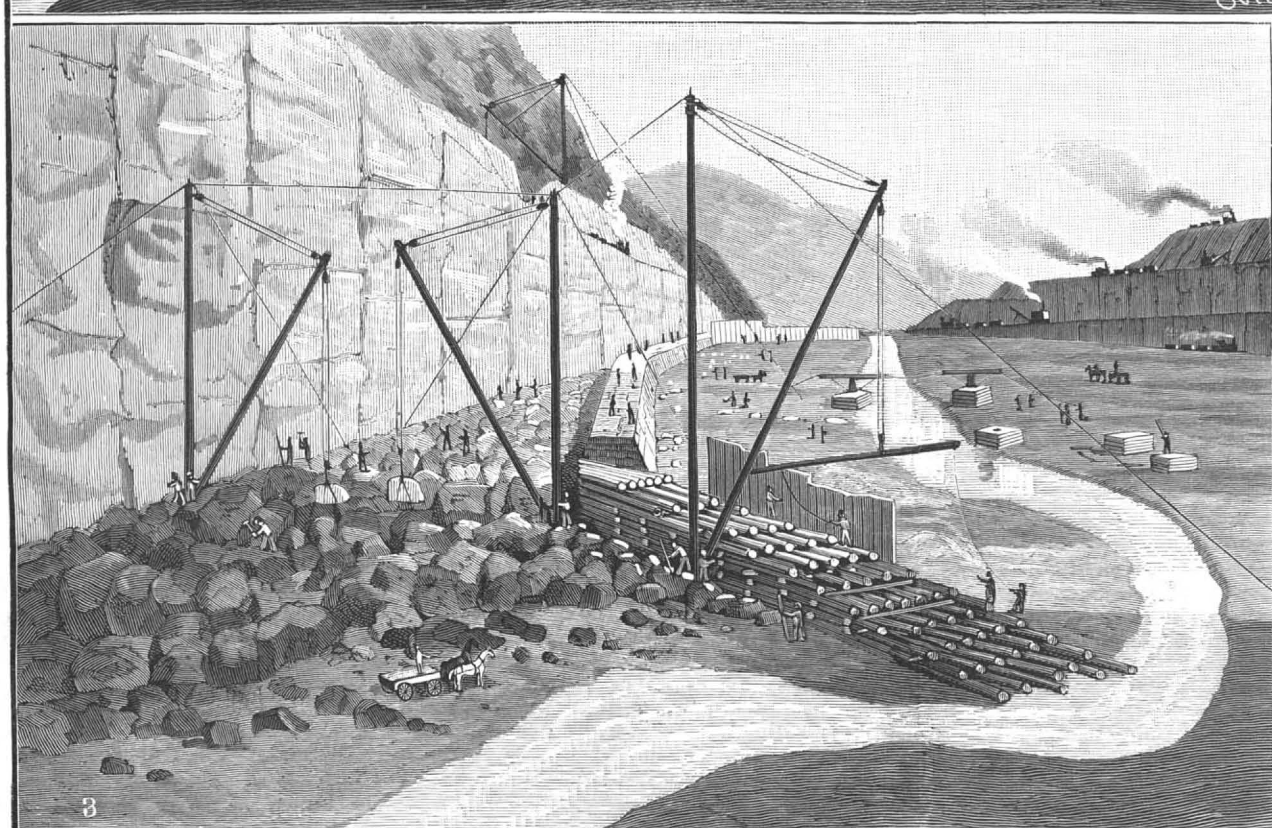

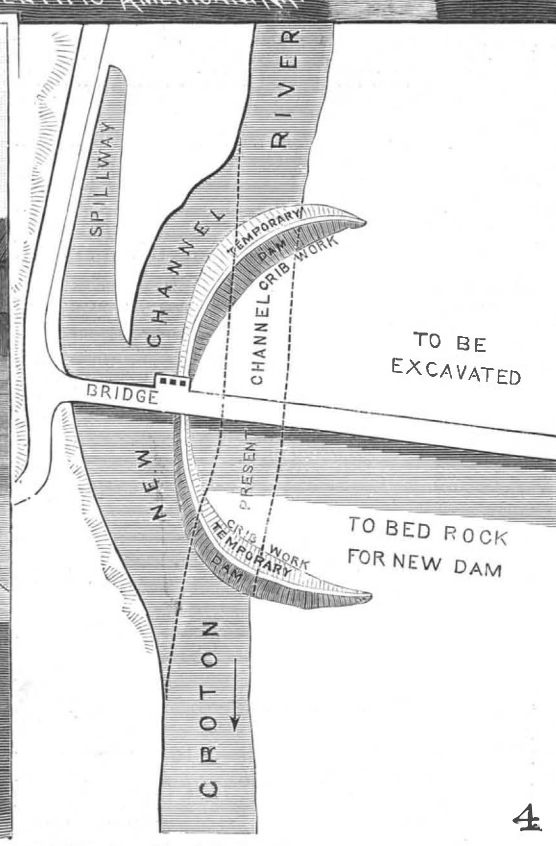

1. General view of the new dam. 2. Progress of the operations on the ground. 3. Building the deflecting dam. 4. Diagram of the deflecting dam.

THE NEW YORK CITY WATER SUPPLY—THE NEW DAM AT CORNELL.—[See page 230.]

Scientific American.

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NEW YORK, SATURDAY, OCTOBER 13, 1894.

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(Illustrated articles are marked with an asterisk.)

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No. 980.

For the Week Ending October 13, 1894.

Price 10 cents. For sale by all newsdealers.

MARS.

At the first meeting of the Astronomical Department of the Brooklyn Institute, which occurred recently, Mr. Garrett P. Serviss, the well-known astronomer and astronomical lecturer, delivered a very interesting illustrated lecture on the planet Mars, in which he reviewed the works of numerous observers, but more especially that of Schiaparelli.

The special interest in Mars at this time is due to the fact that Mars is, or will be on the 20th of this month, in opposition, at which time it will be in a more favorable position for observation than it will be again in two years. The lecturer said the great question in regard to Mars is as to whether it is now inhabited, or whether its ability to support animal life had long since departed.

He said that while some of the observed phenomena required the existence of an atmosphere, Prof. Campbell, of the Lick Observatory, has, by means of spectroscopic observation, proved that Mars shows no more evidence of an atmosphere than the moon. Yet the existence of polar snows and of moisture seemed to indicate the presence of an atmosphere which, although possibly very rare, might be sufficient to support some form of animal life adapted to such an atmosphere.

Indeed, Prof. Campbell's observations were not inconsistent with the existence on Mars of an atmosphere one-quarter as dense as that of the earth. The lecturer referred to the strange markings discovered and mapped by Prof. Schiaparelli, and to the difficulty experienced in verifying the observations of Schiaparelli.

Mr. Serviss learned in an interview with Prof. Schiaparelli, at his observatory in Milan last summer, something of the secrets of the success of the famous Italian astronomer in his observation of Mars. Mars is a red planet, and the light reflected from it is red. Prof. Schiaparelli conceived the idea of a telescope corrected for the red rays, and had an instrument constructed to carry out his idea. The results are known throughout the world, and without a like instrument, no one can call in question the wonderful and glowing reports of Schiaparelli. It was through the munificence of a wealthy lady of Milan, who is interested in astronomical science, that Prof. Schiaparelli was enabled to obtain a larger and still finer telescope of the same kind as that with which his original discoveries were made.

The lecturer said that what, in more recent observations, appeared like a mountain projecting beyond the terminator of the planet might be a chain of mountains with the sun illuminating their peaks, or it might be clouds. He also said that some of the white spots seen on the surface of the planet were in all probability clouds which were shaped by the configuration of the planet's surface, as clouds in our own valleys were shaped by the adjacent mountains.

In conclusion, the lecturer said he hoped the day was not distant when Brooklyn might be provided with facilities as good as any in existence for the use of her astronomers in studies like this.

The St. Louis Union Station.

The boast of St. Louis, that in the new passenger station recently opened there it has the finest building of the kind in the world, is pardonable, if not literally true, for the main structure is spacious and architecturally imposing, and the equipments are on a most elaborate scale. The total cost, including land, buildings, power house, train shed and tracks, was $8,000,000. The passenger station itself is eighty by four hundred and fifty-six feet, and is three stories in height, surmounted by a clock which can be seen from all parts of the city. The material is gray stone. The ground floor is taken up by the carriage entrance, concourse, restaurant, post office, telegraph office, barber shop and wash rooms, emigrants' room and ticket office. The second story contains the general hall, ladies' and gentlemen's waiting rooms, the dining hall, kitchen, smoking room, news and cigar stands, and parcel and check rooms. The third story is occupied by the Terminal Railroad Association's offices. The waiting rooms are richly decorated and are elegant in their appointments. Especially is this so in the case of the ladies' waiting room, which has a tiled floor, walls of blue and white and gold, and heavy oak furniture. The train shed, which covers twelve acres, is built of iron and wood, with a concave glass roof. There is room in it for thirty tracks, besides approaches, platforms and mail and baggage sheds. Five million pounds of iron and four million feet of lumber were used in its construction. Beyond the train shed are three express houses and a milk platform, 350 feet long. The houses are 50 × 250 feet and provided with spurs of track on one side and a pavement for teams on the other. But of all the features of the new station, the arrangements for handling traffic are the most interesting. The thirty tracks are joined by a system of switches to the four main tracks within the passenger station. The power to work the switches and signals is furnished by compressed air delivered through pipes from the power house. The wires are set in motion electrically by means of small magnetic valves. When the operators in the tower desire a certain switch or signal thrown, they move a small lever three or four inches long, which closes the circuits in the tower, and by working the magnet valves at the switch or signal let in the compressed air, which completes the movement. The interlocking system is so constructed that it is impossible to make a mistake. Every switch in a given route must be set in its correct position before the signal can be given for the train to move. In like manner, after a signal is once given a train, it is impossible to move any of the switches on the route governed by the signal, or to give signals for any other routes. The interlocking machine is the largest in the United States. It has 66 switch levers and 65 signal levers, controlling 130 pairs of movable switch points and 103 signals. Some of the switches and signals are nearly 2,000 feet distant from the tower, a distance which would make it impossible to handle them mechanically. Over 127 miles of insulated wire were used to connect the various switches and signals with the tower.—N. Y. Evening Post.

The Steam Jacket.

Professor Thurston has gathered a large amount of data upon the subject of the value of the steam jacket, which contains many illustrations of modern practice, but does not settle the question itself as the results vary so materially. The gist of the arguments and the conclusions of Professsor Thurston are as follows:

1. The jacket should be provided with ample supply pipes and with effective traps or other drainage arrangements, and for removal of air as well as water. If the jacket can be made to drain back to the boiler, that plan should always be adopted. 2. They should be kept supplied with steam at a pressure equal to that in the boiler. 3. All surfaces exposed to full-pressure steam should be jacketed, if practicable. 4. The jacket itself should be very carefully and thoroughly lagged, and so made secure against serious external waste of heat. 5. Provision for safe expansions and contractions should be very carefully made. 6. It should be seen that the jacket steam has everywhere complete contact with the inner or working cylinder, and that all water precipitated therefrom may promptly and completely drain away. 7. The walls of the cylinder, or "liner," should be as thin as practicable, and yet safe; all core spaces should be free and clear; all core sand thoroughly removed; no pockets should exist in which water may gather, and all fits and joints should be made with extreme care. 8. It is probably wise to jacket all the cylinders of a multiple-cylinder engine, if maximum economy is sought. 9. The jacket, in cases in which steam passes through it on the way to the working cylinder, should be designed and proportioned to act as an effective separator. It may then give good results by the currents of steam sweeping the cylinder surface free from films of gathering water. A jacket through which the steam entering the cylinder should pass would have a great advantage in efficiency of heat transfer; but unless the entrained water and condensed steam could be completely removed, it would cause counterbalancing, and probably greater losses, as compared with the usual arrangement, by carrying that water into the engine to exaggerate waste. In all cases, and under all conditions, the use of a steam jacket is "a violation of the fundamental law of maximum efficiency of heat engines, which requires that they should receive all their heat at the maximum and give it out at the minimum temperature, and not, as in the case of an engine with a steam jacket, at temperatures between these, and at times when the heat imparted lessens efficiency, which it evidently must do at and near the end of the stroke." It is "a necessary evil, justified only by the conditions affecting the use and the construction of the engine. The advantage to be derived thus varies according to circumstances, and the jacket may not only sometimes be useless, but wasteful." That is where one difficulty comes. In actual practice the engine jackets do not get that care and drainage they do when tested, and they never will, and this fact will go a long way to keep steam jackets off engines.

The New Record of the Lucania.

The Cunard steamer Lucania arrived off Sandy Hook, September 28, having made the trip over a course of 2,782 miles in five days, seven hours and forty-eight minutes, breaking all records. The previous fastest trip, ending September 14, was made by the same vessel between Sandy Hook and Daunt's Rock, the time being five days, eight hours and thirty-eight minutes. By a singular coincidence this eastward trip was made in exactly the same time as the preceding (westward) trip which ended August 31. The eastward voyage was, however, the longest as regards distance. The performance of the Lucania in making two successive trips of nearly three thousand miles with the precision of a ferryboat is one of the most remarkable feats of ocean navigation. The Lucania also holds the record for the greatest day's run, 560 miles, and for the best hourly speed across the Atlantic, 21·89 miles.

A Locomotive Load.

A certain Eastern road has a large number of ten-wheeled locomotives, which at this season of the year have been rated both east and west bound at 40 loaded cars. When this rating was made the maximum car capacity was 40.000 pounds, and the average car load in both directions was supposed to be about 10 to 12 tons. The yardmasters, train dispatchers, and division superintendents have never had any means of knowing what tonnage cars contained, and have followed the rule to give the engines loads equal to 40 loaded cars. The advent of the 50,000 and 60,000 pounds capacity cars resulted in a slight reduction in the rating when the train was composed of a large number of large capacity cars. Recently the road in question has been making some interesting investigations to ascertain what tonnage was being hauled by locomotives. The following table, which we are permitted to print, shows the tonnage and characteristics of the freight on certain east bound trains for one day:

Number of loads.	Freight.	Total pounds.	Average lb. per loaded car.
36	Flour, beef, and mdse................	876,278	24,341
23	Cattle..................................	510,920	22,214
38	Cattle and beef....................	806,800	21,232
34	Sheep, horses, and provisions.........	751,200	22,094
31	Grain and mixed freight..............	1,025,136	33,069
34	Beef and provisions.................	742,908	21,850
36	Cotton, malt, and provisions....	992,343	27,565
37	Flour, provisions, and mdse..........	867,038	23,433
38	Flour, provisions, and grain..........	986,889	25,971
34	Cotton, flour, and provisions.........	910,105	26,768
29	Lumber and mixed freight...........	654,450	22,567
33	Sheep, cattle, and beef.....	733,510	22,228
403	....	9,857,577	24,460

It will be seen that the average car load varies from about 10½ tons to 16½ tons, according to the characteristics of the freight. Engines drawing 37 and 38 loaded cars, and erroneously supposed to have been loaded nearly up to their economical capacity, had in reality much lighter trains than another engine of the same class with only 31 loaded cars. An official of the transportation department of the road in question advises us that these engines will make fair time with trains of 40 cars of coal or grain averaging 50,000 pounds a car. This would appear to establish the maximum capacity of these engines at about 2,000,000 pounds, or 1,000 tons of paying freight on a road whose maximum grades do not exceed 35 feet per mile. His investigation has developed the astonishing fact that, as now rated, his engines in many cases are not hauling half that amount of tonnage. The demand for quick time with high class freight unquestionably has much to do with the light loading of locomotives, but the principal factor is the erroneous idea of rating locomotives upon the basis of the number of cars per train.

Another fact worthy of note is that the above tabulated statement only shows east bound trains, upon which the average car load is about 12 tons. Our informant states that his investigation proved that the tonnage west bound was found to average only a little over 6 tons per car. West bound freight consisted mostly of light and bulky merchandise and not much of it in a car, but no difference was made in the rating of the locomotives. In one instance he found 15 loaded cars in one west bound train which did not average more than 3,500 pounds per car, making the aggregate equal to only one good big car load.

This road is now considering a plan to increase the average tonnage of freight per car, and to change the basis of rating locomotives from the car basis to the tonnage basis.—Equipment Guide.

Modern Glass Making.

The maufacture of glass has progressed so rapidly in the last twelve years that it may now pertinently be asked what cannot be done with glass. M. J. Henrivaux, a prominent French manufacturer of this article, an original and enthusiastic inventor, has recently proved to us, by means of a veritable museum of curious samples, that everything is becoming possible to the modern glassmaker. Even conducting pipes of large diameter have been made of it, tiles, drains, tubs, curtains, furniture, chimneys, and even houses.

Glass is now blown mechanically. M. L. Appert, vice-president of the Society of Civil Engineers, some years ago substituted for the human breath an injection of compressed air. This was a great advance in the perfecting of glassmaking. The work of blowing was painful and injurious to the health of the workmen; to-day it is the machine which blows; the lungs rest. And as this machine has the breath of a giant, it has become very easy to manufacture objects of great size. This industry has been still further revolutionized by methodical moulding. This was formerly done by placing the glass, which had been made plastic by heat, between two metallic surfaces. But these surfaces cooled so quickly, and the glass with them, that it was impossible to obtain large pieces. M. Appert went resolutely to work to find some way of moulding while the glass was in a malleable condition, so that larger pieces could be made. At a short distance from the melting oven is fixed a post, to which a vertical mould is attached, which opens in two or three places on hinges. This mould is of very thick cast iron and retains the heat. A vertical core moved by a machine crosses the mould from side to side. The melted glass is poured into this mould in suitable quantities. The core is turned rapidly. The glass is driven against the walls of the mould and takes the impressions. Several moulds are grouped and form a battery. If pipes are to be moulded, a length of two meters is given to each one; the battery is comprised of eight moulds and cores; these easily perform fifteen operations an hour and produce thirty meters of pipe, which, with the waste, gives a production of five hundred meters a day. By this method glass pipes are produced which rival those of sandstone and even of cast iron, and which have the advantage of not being affected by the soil. The resistance of glass is very great. Glass slabs can very easily support carriages of great weight, and champagne bottles are veritable explosive machines, charged with a pressure of twenty-five atmospheres. For certain experiments in physics, gas with a pressure of one hundred atmospheres has been sometimes placed in glass tubes.

M. Henrivaux hopes to have a house made entirely of glass as one of the sights of the next exposition. The walls will be constructed of an iron skeleton, on which will be placed slabs of glass in such a manner as to form a double wall, in the interior of which hot air will be circulated in winter, and in summer compressed air, which will cool the walls. The roof will be of glass on a network of iron, and also the walls, the staircases, etc. As glass lends itself readily to all kinds of decorations, brick, marble, etc., can be imitated.

Flat surfaces are now being manufactured which are very pretty. On one of the surfaces are shown, in relief, various designs obtained at the moment of cooling by the action of a stamping roller. These can be gilded or silvered in various combinations. They are used in decorating walls, ceilings, etc. We will soon even have glass hangings and tapestries. M. Henrivaux draws on glass with an aluminum pencil. The metal remains on the glass, and the designs appear in very soft tones. We may look forward to many surprises connected with this material.—Public Opinion, from Journal des Debats.

Chilled Shot for Stone Sawing.

The use of chilled metallic shot has completely revolutionized the stone sawing trade, by reason of the rapidity with which the work can now be accomplished as compared with the times when the sawing material consisted only of quartzose sand. It is obvious that in sawing granite, for instance, the sand alluded to, not being harder than quartz, was incapable of doing much work, as that mineral exists so abundantly in granite. What was wanted was something harder than quartz. Several minerals answered the purpose, among which were corundum (emery) and the diamond. The former of these is occasionally used for sawing, and largely for rubbing granite, marble and the like, preparatory to the polishing process; the latter has for some years been employed to a limited extent for sawing the hardest kinds of stone, and diamond disks may be found in the workshops of every lapidary. But these minerals are rather expensive, especially the latter, and until within recent years sharp sand was still almost universally employed Then a new material, known as chilled shot, was introduced and was rapidly taken up. During our visits to various granite centers in 1886-87 we found it had already gained a firm foothold, as the rate of sawing was greatly increased by its use; it was also very economical in working, and has been much employed to this day. The foregoing observations were suggested by some samples and a trade description of "Krushite" recently sent to us, which is said to be a new material. It appears to be chilled metallic shot, and is very similar to, though probably not identical in composition with, what we saw in use some eight years since. At any rate, the use of chilled metallic shot for sawing hard stone is by no means a "new" idea either here or in America. 'Krushite" is said to be capable of sawing blocks of granite at the rate of four inches and hard grit stone at nine inches in depth per hour, with twelve blades in the frame. It is manufactured in several different sizes, the largest (about the size of small rabbit shot) being suitable for sandstone and the smallest (fine dust) for the rubbing bed. The material is used in sand blast apparatus in lieu of sand, and in substitution for diamonds in boring and drilling. It is described as being absolutely without points or edges, though we do not find this statement borne out by the samples sent. However, there can be no question that the chilled metallic shot is by far the best and most economical material hitherto discovered for sawing the hardest descriptions of stone and for use in the initial stages of rubbing. It must be handled with great care, though, in the manufacture of marble. Only the other day we saw a beautiful slab utterly ruined during the final polishing with putty powder, by reason of a few chilled shots having found their way under the felt polisher, with the result that the smooth surface of the stone was deeply scored before the machinery could be stopped. That, of course, is sheer carelessness; the fact that the chilled shot was capable of scratching so deeply in such a short space of time is distinctly in its favor as a sawing material.—The Builder, London.

Long Distance Water Power Transmission.

Various modifications of turbines and water motors have in recent years been applied to the utilization of water powers heretofore thought impracticable, but which have become available through the introduction of the electrical system of transmission. Water powers located at inaccessible points can be made to furnish or transmit the power to places of convenience, where it can be utilized for any purpose in demand, the distance of such transmission being limited only to cost of the transmission line, the generator and the motor, long lines, of course, sacrificing to a greater or less extent the available effect, but frequently are desirable even at considerable loss of power.

There are, according to the Electrical Review, three pairs of water wheels at the Falls of Juanacatlan, Mexico, each of which is rated at 600 horse power, or, approximately, an aggregate of 1,800 for the three pairs, but two pairs only are in constant use, the other pair being held as a reserve power, and to be used in case of accident in the motive power plant. The distance over which the power is transmitted is nearly 18 miles, being situated over 17 miles from Guadalajara, one of the largest cities in the republic of Mexico, to which point this power is carried and the electric lighting of the city accomplished.

These 20 inch turbines are placed under a head of 60 feet, and are producing remarkably fine results. They combine a number of new features and important improvements adapted to turbine use, and their automatic regulation has proved highly satisfactory. They represent the highest art in turbine building, the wheel, or runner proper, being made of bronze, the shafts of the best hammered scrap wrought iron, and other parts of the combination requiring strength are made of steel, the whole design being of the most perfect construction.

The transmission of the power from the turbines is made to an intermediate line shaft, from which shaft the power is taken to the generators and is accomplished by the modern hemp rope improved transmission. The ropes are of the continuous style passing from a groove in the pulley on the water wheel shaft to a groove in the pulley on the main power line and from that groove returning again to an adjacent groove on the water wheel pulley and thence to another groove on the main line, thus returning back and forth until 16 grooves are filled on the water wheel shaft. In order to keep the rope taut, a carriage is placed between the pulley and the water wheel shaft on the main line, to which is attached a counterweight. This carriage pulls back and forth, somewhat upon the cable railway plan, thus easily and nicely effecting a uniform tension in the rope in all conditions of the atmosphere and under all variations of power given by the wheels.

The power is taken from the pair of 20 inch water wheels by two of these rope pulleys, one placed on each side of the pair of wheels. Of course, the same arrangement is observed in both of the other pair of wheels, all being connected to the same main intermediate line shaft, from which the power is belted to the generators.

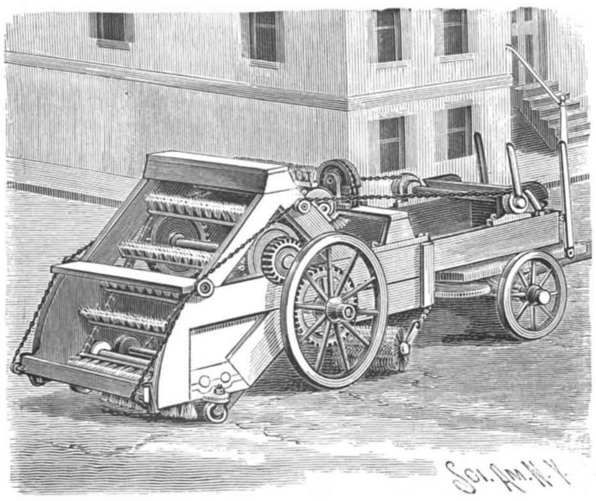
Solder for Aluminum.

The only solder for aluminum which has attained to any extensive use, and which may be said to be the most successful thus far invented, is that of Mr. Joseph Richards, of the Delaware Metal Refinery, Philadelphia. Mr. Richards found that by adding a small percentage of phosphorus to the best solders hitherto used they were invariably improved, the particular point of advantage being their increased ability to bite on the aluminum. The best alloy thus prepared contains zinc, tin, aluminum and phosphorus, the first two constituting the bulk of the alloy, and being united in their chemical equivalents as a true alloy. This solder can be used before the blowpipe or with a soldering iron. In the former case, a little silver can be added to it without making it too hard to melt, and giving it a better color. For use with the copper bolt, this solder leaves little to be desired. The surfaces to be united are first scraped clean, and then tinned with the solder itself, by rubbing it on hard with the bolt. The prepared edges are then soldered together with ease, using a hot iron and no flux of any description. This solder has been adopted for over two years by the Swiss Aluminum Company, the largest manufacturers of aluminum, and by the largest makers of aluminum goods in America.

While nothing terrestrial can be said to be so good that no better could be wished, yet, in view of the improvements in soldering aluminum made since 1890, it may reasonably be asserted that a satisfactory solution of the problem has been reached.—Aluminum World.

AN IMPROVED STREET SWEEPER.

This machine delivers its sweepings into a vehicle, of which the sweeping mechanism forms a part, means being provided for conveniently dumping the vehicle and for readily lifting the sweeping mechanism from contact with the ground, as desired, when the machine is to be moved from place to place. The improvement has been patented by Mr. Frederick W. Dessau, of No. 10 Willard Street, Amsterdam, N. Y. The body, which receives the sweepings, has a central well, whose rear wall supports an inclined board over which the main brushes operate, between sideboards, in carrying the sweepings up into the vehicle, preventing the escape of dust. The elevator has lower movable sections with caster wheels, which travel on the ground when the machine is in operation, and in these sections are journaled rollers over which pass endless chains, in which are secured the heads of the main brushes or brooms, the chains being moved by sprocket wheels actuated from the main driving shaft, and the latter being driven by gear and clutch connection with the hubs of the rear supporting wheels of the machine.



DESSAU'S STREET SWEEPER.

The lower movable sections of the elevator are held in position for the brushes to contact with the ground by means of latches, but to the latches are attached chains carried over friction rollers to a drum at the rear of the driver's seat, the arrangement being such that by operating a lever the driver can lift the brushes out of contact with the ground. At each side of the machine, in advance of the elevator and main brushes, is a brush set at an angle, to sweep the dirt into the path of the rear brushes, the side brushes being raised from contact with the ground by levers in convenient reach of the driver, the levers being connected by chains with the brush supports, and the arrangement being such that each side broom may be manipulated independently. The dumping is effected by means of chains connected with two downwardly opening doors in the bottom of the vehicle body, the chains extending upward over a flanged segmental drum in central bearings at the top of the machine, the drum having a handle and latch.

AN IMPROVED GUN-SIGHT.

A convenient gun-sight for firearms, which may be readily taken from the gun and carried in the pocket when not in use, is shown in the engraving, and has been patented by Mr. Harold Strandwold, of Trysil, North Dakota. It consists of a standard having a forked lower end and at its upper end a disk with a peep hole. In the forked end of the standard is a clamping screw, whereby the standard may be clamped to a plate held in inclined position on the stock, the plate having longitudinal grooves adapted to be engaged by projections on the lower ends of the forks, as shown in the small sectional view. When the clamping screw is loosened the sight is readily moved forward or backward, as desired, along the stock plate, or can be removed entirely by sliding it off from one end of the plate.

OLD AND NEW BUILDINGS OF NEW YORK.

We have recently illustrated in these columns on several occasions the progress of building in this and other cities. Our present cut gives a view of the lower portion of New York, taken across the East River from the Brooklyn shore, and brings into vivid relief the contrast between the old and the new. The background of the picture is almost filled with the gigantic buildings erected during the last few years. As a species of bench mark the spire of Trinity Church, seen toward the right of the cut among the buildings may be referred to; this in its day was the highest structure within the area which we show. Now it is dwarfed. In the extreme right of the picture is the beautiful building of the Lawyers' Title Insurance Company, now barely completed. Next to it on the left towers up the building of the Mutual Life Insurance Company, its walls surmounted by a loggia just under the roof. This top story is devoted to the uses of the Insurance Club of New York City, containing restaurant, reception rooms, and the like. The open corridor surrounding the rooms it is designed to close by glass for the winter. Higher than this building, and further to the left, surmounted by a tower and dome, is the great Manhattan building, the tallest office building in the world. It fronts on Broadway with seventeen stories, 242 feet from curb to parapet, while the dome and tower rise 108 feet more, giving a total of 350 feet. Its foundations, laid by caissons, go down over 50 feet below the street level. It contains its own independent electric light and power plant.

Other buildings only inferior to it in height surround it on all sides. Referring to the cut, between the lower stories of the Manhattan Life building and the spectator is the Wallace building. As we go downtown, the Custom House in Wall Street, famous in its days in the way of impressive architecture, is almost hidden. A little to the left of the center of the picture is seen the small hemispherical dome of the Washington building, No. 1 Broadway, and a little to its left appear the Welles building and the Standard Oil building, all situated on Broadway. Still keeping to the left, we find the low tower of the Cotton Exchange and immediately back of it the very tall tower of the Produce Exchange. Further down town the United States Army building, almost fort-like in appearance, can be seen.

STRANDWOLD'S GUN-SIGHT.

The foreground of the picture presents a different scene. South Street, entered by Burling Slip, Fulton Street, Beekman Street and Peck Slip, appears, with old and new houses intermingled, the old ones with their gable roofs, never exceeding four stories in height, presenting a great contrast to their near neighbors, the giant office buildings already described. Peck Slip is seen on the extreme right of the picture, while South Street runs along the river edge. It is in this corner of the picture that some of the most

THE CHANGING ARCHITECTURE OF NEW YORK.

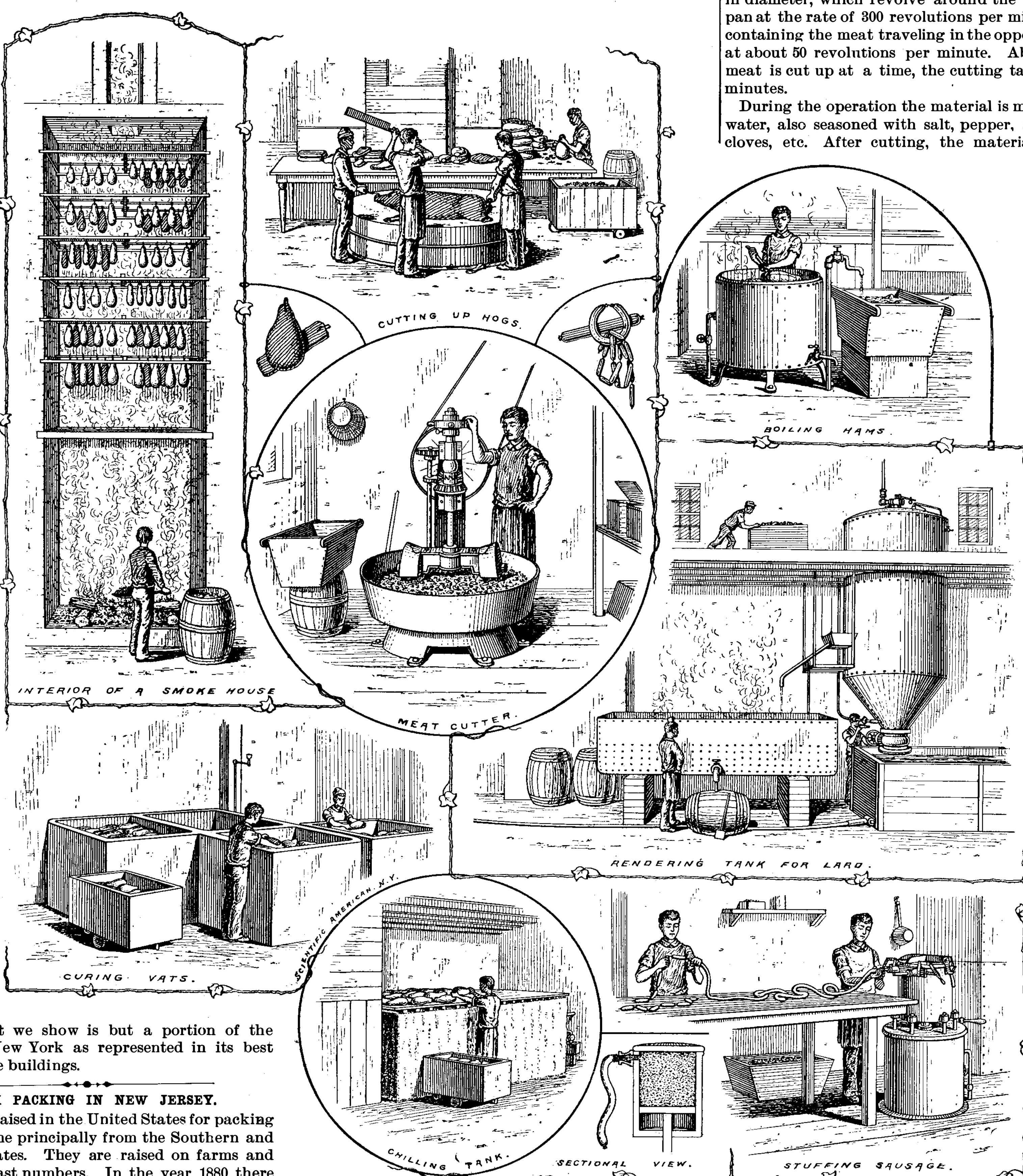
distinctively old buildings are seen. Back of this region is the old time United States Hotel, one of the oldest hostelries of the city, with its square tower and cupola presenting an interesting reminiscence of the past. Fulton Market and the wholesale Fish Market are seen occupying prominent positions on South Street. Off the fish market lies a fleet of fishing smacks, representatives of one of the best developments of old time naval architecture, while in the foreground the propeller Richard Peck, of the New Haven line, is a representative of the most advanced type of Sound steamer.

It would be very difficult to approximate the millions of dollars represented by the steel framed, fireproof buildings of the downtown business district of New York. What we show is but a portion of the wealth of New York as represented in its best class of office buildings.

PORK PACKING IN NEW JERSEY.

The hogs raised in the United States for packing purposes come principally from the Southern and Western States. They are raised on farms and ranches in vast numbers. In the year 1880 there were reared within the limits of the United States, 49,772,700 hogs. The pork packing industry is carried on principally in the Eastern and Western cities. In this part of the country (Jersey City) the first process is the cutting up of the pork. A hog is first halved or split lengthwise, then placed on a circular chopping block about 6 feet in diameter and about 2 feet in height. The operator then with a 22 inch cleaver cuts the animal up into hams, shoulders, bacon, etc. As soon as the parts are severed the attendants, by means of hooks, pass the pieces along to the trimmer, who cuts and trims the hams, etc., into shape. An expert cutter can cut up 120 hogs per hour, making 17 cuts for each hog. After the parts are trimmed they are put into trucks and taken to the chilling room. The chilling tank is made of iron, 15 feet in length, 7 feet in width, and about 5 feet in height, and contains about 2,500 gallons of brine, at a temperature of about 8° to 10° above zero. On top of the tank is a wooden frame, upon which are placed about 300 hams, etc. These hams, etc., are left to chill for about 24 hours, which takes out the heat and prepares them for curing. The curing vats are made of artificial stone. They are about 4½ feet square, 5½ feet in depth and about 6 inches in thickness. About 3,500 pounds of the meat is placed into each of these vats in a 65° solution composed of water, raw sugar, and salt and left for thirty-five days. At the expiration of five days, the top pieces are placed down at the bottom and then left for the remaining number of days. After curing they are removed from the vats and placed into hogsheads of cold water and soaked for about ten hours, the soaking process drawing out the salt and also preventing them from turning white after leaving the vats. After soaking they are laid on benches and a cord run through the shanks, and then carted to the smoke house. The smoke house is made of brick and is from top to bottom about 25 feet in height and 6 × 10 feet in width. The hams, etc., are hung on circular iron rods, the ends of which rest on iron bars set into the brickwork a few feet apart, one over the other. About 375 hams are strung on these rods at a time, the pieces being placed so as not to touch each other. A hickory wood fire is then started at the bottom of the house and about a half barrel of mahogany sawdust thrown on, which smoulders and throws out the smoke, which ascends upward through the rows of hams above, slowly smoking and coloring them. After smoking for 15 to 20 hours, they are taken out and are ready for market. Hams that are to be boiled go through the same process of curing as the others. After being soaked, the bone is taken out and the ham tied up with strong twine, each ham taking about 6 feet. About 40 of the hams are then put into a jacket boiler, which has first been heated up to a boiling point and allowed to simmer for 4½ hours. These boilers are 4 feet in diameter and about 4 feet in depth. The hams shrink in cooking about two ounces to the pound. The bellies of the hogs also go through the curing process, and are salted and packed into wooden boxes in 550 lb. lots and shipped to all parts of the country. The trimmings from the pork are made into sausage, bologna, etc. The meat is first cut up into about 3 inch chunks and put into a revolving meat cutter. The circular pan in which the meat is placed is about 36 inches in diameter and about 14 inches in depth, the bottom of which is made of hickory blocks securely pinned together. The meat is cut up by four circular knives, 12 and 9 inches in diameter, which revolve around the center of the pan at the rate of 300 revolutions per minute, the pan containing the meat traveling in the opposite direction at about 50 revolutions per minute. About 300 lb. of meat is cut up at a time, the cutting taking about 10 minutes.

During the operation the material is moistened with water, also seasoned with salt, pepper, sage, allspice, cloves, etc. After cutting, the material is put into wooden trays and taken to the sausage stuffer. The stuffer is an iron cylinder 18 inches in diameter and 24 inches in depth, and is securely bolted to the top of a circular steam chest. At the bottom of the stuffer is an accurately fitting plunger or piston, which connects with the steam chest. About 80 lb. of the chopped meat is put into the stuffer and the cover clamped down. The steam is then turned on at a pressure of 60 lb., which forces the plunger upward, which, in turn, presses the material up against the cover, the chopped meat finding an outlet through two small spouts connected to the side of the upper part of the stuffer. The meat is forced from the stuffer into the casings of hogs, beef, and sheep. The casings are drawn over the spouts by the hands, and, when full, the supply of material is cut off by means of a gate, which can be opened and closed by the operator. Some of these casings are thirty yards in length. Two



PORK PACKING IN NEW JERSEY.

men can run out about 600 lb. of sausage meat per hour. The sausage is then linked by an operator, giving the stuffed casing a winding movement as it is held in his hands, one or more twists forming the link, the operation being repeated until the whole casing is formed into links. The large casings come from the neck of the bullock, they being about two feet in length. Before smoking sausages, a hot green hickory fire is required, burning at least two hours. This makes an intense smoke, which circulates through the material, the smoking being finished in about thirty minutes. The fat of the hogs is put into what is called a rendering tank. This tank is circular, being funnel-shaped at the bottom. It is made of steel, and is 15 feet in height and 6 feet in diameter. Two or three pails of water are first poured into the manhole at the top of the tank, and 10,500 lb. of hog fat is added; the manhole is then closed and about 50 lb. of steam turned on, which thoroughly melts the fat in about eight hours. The plate is then taken off at the top and the melted lard allowed to run out through a cock about six feet from the top of the tank down through a pipe to a cooler below. After the melted material is run out above the cock the remaining lard is forced up and out by running in water at the bottom of the tank. After the lard has all passed out, the gate at the bottom of the tank is opened, letting out the scrap, which falls down into the water box below. The lard, if any, escapes with the scrap and floats on the surface. This is scooped out and put into the cooler and the fat taken out of the scrap by means of a press. Water is then let into the tank at the top, cleaning it out for another supply of fat. The cooler is made of iron 10 feet by 6 inches in length and 3 feet 6 inches in width and about 3 feet in height. After the lard is run into the cooler, the steam is turned on for one and one-quarter hours, to take out the water that escaped out of the tank with the lard. It is then allowed to cool for twenty-four hours, and then run into 400 lb. barrels for the market. Exported pork products amount to about $37,000,000 yearly; lard amounting to $22,000,000 yearly. Fresh pork consumed in 1880 in the United States amounted to 506,077,052 lb.; salt pork, 859,045,987 lb.; bacon and hams, 1,122,742,816 lb.; lard, 501,471,698 lb. The sketches were taken from the plant of Bush Brothers, Jersey City, N. J.

Ebonizing Wood.

Photographic Work says that the best way to produce the beautiful black so admired in certain articles of furniture, etc., is to moisten the surface with dilute sulphuric acid, and then heat until the desired stain is produced. The rationale is, of course, that the heat drives off the water, and so concentrates the acid that it carbonizes the tissue.

Such dilute acid, to which a little white sugar has been added, makes an excellent "sympathetic ink," the writing being invisible till the paper is heated, when the acid abstracts the water from the sugar, liberating the carbon.

The Cold Bend Test.

At the Brooklyn meeting of the American Association for the Advancement of Science, Mansfield Merriman, in his vice-presidential address on "The Resistance of Materials under Impact," said that during all this development of static testing one impact test has survived and everywhere held its own. This is the cold bend test for wrought iron and steel. In the rolling mill it is used to judge of the purity and quality of the muck bar, in the steel mill it serves to classify and grade the material almost as well as chemical analysis can do, and in the purchase of shape iron it affords a quick and reliable method of estimating toughness, ductility, strength, and resilience. It is true that numerical values of these qualities are not obtained, but the indications are so valuable that if all tests except one were to be abandoned, the simple cold bend test would probably be the one which the majority of engineers would desire to retain.

Preservation of Wines.

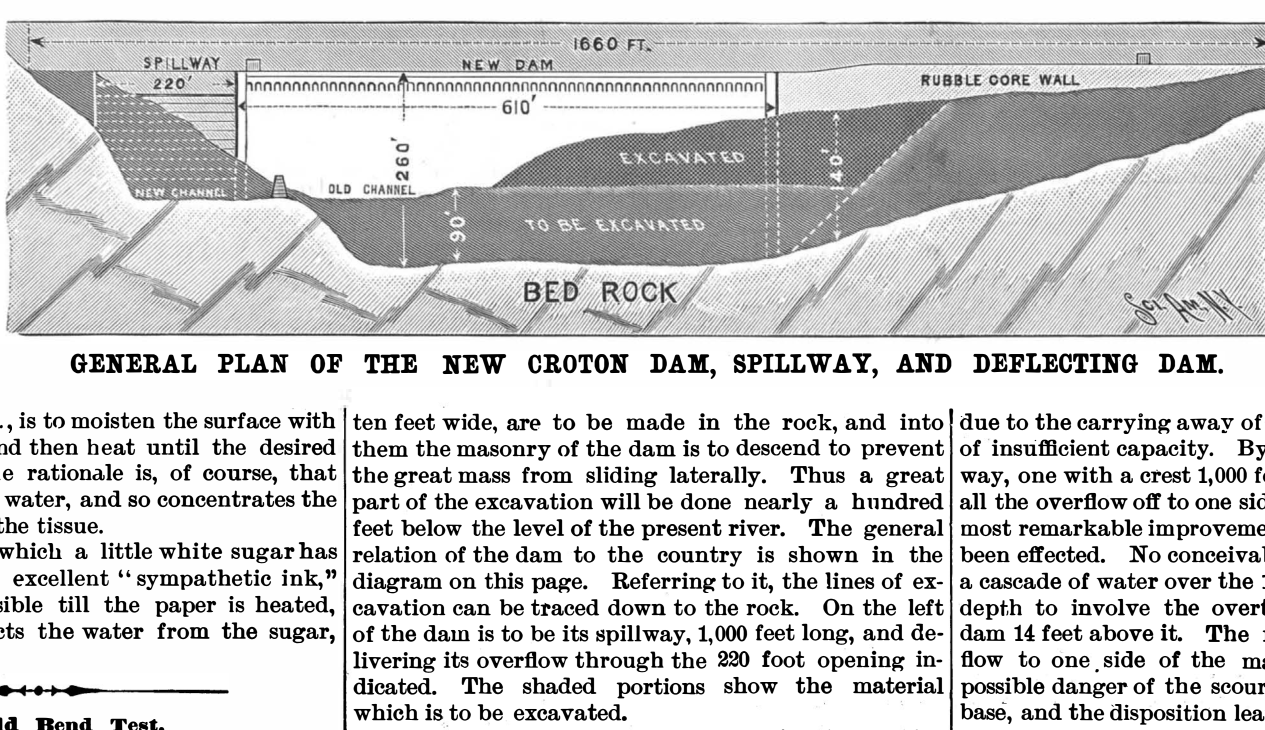
The calcium salt of β-naphthol sulphonic acid $(C_{10}H_7OSO_3)_2Ca + 2H_2O$, previously described under the names of asaprol (Jour. Soc. Chem. Ind., 1892, 772) and abrastol, has been found to exert a remarkable preservative influence on wine, entirely preventing as it does, even under the most trying circumstances, the development of acidity, etc. Moreover, Dujardin-Beaumetz and Stackler have shown that the new antiseptic is perfectly harmless to the consumer, even when used in much larger quantities than necessary for the preservation of wine (ten grms. per hectoliter).

THE NEW CROTON DAM ON THE CORNELL SITE.

Over two years ago, in the SCIENTIFIC AMERICAN of July 9, 1892, we illustrated the new Croton dam and lake to be formed through its agency for supplying the city of New York with water. In 1842 the original and present Croton dam was built, and in connection with the aqueduct of the same period it secured for many years a supply of water for New York. The old aqueduct running from Croton Lake to the city was carried along near the surface of the ground, describing almost a contour line on its serpentine course to the south. Some years ago the new aqueduct was completed. This was built on radically different lines from the old one, taking a far more direct course, and in many places being many feet underground.

As it became manifest that the old Croton Lake was of insufficient size for its purpose, other dams were built back of it, to some extent increasing the water impounded. But nothing definitely final or adequate for the provision of a sufficient reservoir of water had yet been done, and Quaker Bridge dam was proposed; a gigantic structure which would have surpassed anything of its kind which the world had yet seen. This dam it was proposed to erect near the Hudson River, the structure crossing the valley through which the Croton River runs on its way to the Hudson River. Then Mr. M. A. Fteley, chief engineer, proposed instead of this a dam immediately below the present one, much higher and increasing the reservoir capacity enough for the needs of years to come. After much discussion an intermediate site was chosen for the new dam—the Cornell site as it is termed—about 3½ miles below the old Croton dam. The formation of the valley of the Croton is such as to provide excellent sites for dams, its somewhat precipitous sides acting as walls for the reservoir and as abutments for the dam.

Our small cut gives the general view of the new Croton dam as it will appear when completed. The part on the right is to be of earth with a rubble masonry core. Then comes the masonry dam, founded on the bed rock, in some places ninety feet below the surface. All the earth is to be removed and the dam is to be built on the solid rock. Two trenches, each ten feet wide, are to be made in the rock, and into them the masonry of the dam is to descend to prevent the great mass from sliding laterally. Thus a great part of the excavation will be done nearly a hundred feet below the level of the present river. The general relation of the dam to the country is shown in the diagram on this page. Referring to it, the lines of excavation can be traced down to the rock. On the left of the dam is to be its spillway, 1,000 feet long, and delivering its overflow through the 220 foot opening indicated. The shaded portions show the material which is to be excavated.



GENERAL PLAN OF THE NEW CROTON DAM, SPILLWAY, AND DEFLECTING DAM.

The excavations are rapidly progressing to a point when the Croton River has to be disposed of, and our large cut shows the present condition of the work. The soil is attacked on several levels, and trains of dump cars are busily traversing the terraces and the bottom, carrying off the earth, the whole making a most impressive scene. Through the excavations the Croton River is seen winding its way toward the Hudson. Cribwork is in process of construction on the right, which is to form the basis of a deflecting dam to carry the water of the Croton River to one side. In the diagram on the front page is shown the plan of the deflecting dam, and the change it is to produce in the river channel is there indicated. In itself this is a remarkable achievement. An approximately semicircular line of cribwork is carried along near the edge of the excavation, and by addition of earth the dam is to be completed and the river is to be turned into the new channel thus provided. This will leave the ground to the south clear for excavation. The work on the deflecting dam is shown more in detail in the lower cut on the front page. On the left the rock rises vertically, while the cribwork determines the general line of the deflecting dam.

A visitor to the Croton region will, in summer, find little or no water passing through the bed of the Croton River below the present dam, the great consumption of water in New York absorbing practically the flow of the river. But at other seasons the great watershed delivers a quantity in great excess of the New York consumption, and it is this excess which the new dam is intended to impound, and which has to be deflected from its course, as the foundations for the new dam in being made upon the bed rock involve the removal of 90 feet of soil underlying the present water course. As engineering achievements advance, the deflection of a river, as in the present case, becomes an incident of the greater work, but it is none the less one of the remarkable things done in the construction of this dam.

When the dam is complete, it will provide a reservoir of some 30,000 millions of gallons capacity in place of the present one of only 2,000 millions capacity. As the water rises, it will submerge the present dam and Muscoot dam far back in the interior. Its peculiar shape is seen in the small view of the completed work, where is shown the spillway, running back nearly at right angles to the main dam, and the overflow being delivered through the new channel at the north end. Over the gap between the dam and the side a bridge is to be erected, and a roadway will run across the valley over the bridge and along the crest of the dam. It is proposed to construct two other roads, one along the north side and the other along the south side of the lake.

The general dimensions of the dam are as follows. It will be understood that owing to the nature of the work they will be departed from a little in practice. The earthwork dam has a maximum height of 245 feet from the bed rock, where its base is 550 feet wide. The crest is 30 feet wide. The slope of the sides is 1 foot vertical on 2 feet horizontal. A rubble core 225 feet high, 18 feet thick at the base and 6 feet thick at the top, runs through its center.

The masonry dam is to be 610 feet long, 238 feet high from the bed rock, 188 feet thick at the base, and $21\frac{25}{100}$ feet thick at the crest. It is to rise 150 feet above the restored surface or bottom of the lake, at which level it will be $109\frac{79}{100}$ feet thick.

By running the spillway off nearly at right angles an immense overflow capacity is secured. This is one of the most remarkable and original features of the work. The maximum section of the spillway gives it a height of 142± feet and a bottom width of $119\frac{16}{100}$ feet. The outside face is made up of a series of steps in general of 8 feet rise and 4 feet horizontal plane. Its crest is 14 feet below the crest of the dam.

The gap left between the spillway and bank is crossed by the bridge already mentioned, and the total width of the gap closed by the dam and bridge is put at 1,660 feet.

The great Johnstown disaster was due to the carrying away of a dam whose spillway was of insufficient capacity. By providing so large a spillway, one with a crest 1,000 feet long, and in removing all the overflow off to one side of the base of the dam, a most remarkable improvement upon the usual plan has been effected. No conceivable freshet could maintain a cascade of water over the 1,000 feet crest of sufficient depth to involve the overtopping of the top of the dam 14 feet above it. The removal also of the overflow to one side of the main structure removes all possible danger of the scouring of the earth from its base, and the disposition leaves the main dam intact in its work of supporting the hydraulic pressure of the water without its having to supply an overflow. The spillway and dam are separate and distinct elements of the structure.

Removing Old Bolts.

One of the most difficult operations in the repairing or rebuilding of locomotives is the removing of old bolts from the frames of engines. These bolts are originally machine fitted, which alone would make their removal difficult, but as they are always badly rusted the process is doubly tedious. The method always in use is to force them out by upward blows from heavy hammers, but frequently the drill has to be used. The Boston Journal of Commerce says: A workman in the Erie railway shops, at Hornellsville, N. Y., conceived the idea that these bolts could be quickly and effectively removed by a projectile fired from a cannon. The master mechanic resolved to test the idea, and a steel mortar-shaped piece of ordnance was made for the purpose, with a two inch bore, seven inches deep. This is fitted with a steel projectile the same length as the bore. The first test of this novel tool was made recently. The mortar was loaded and the drill projectile placed beneath a bolt in an engine frame. At the first discharge the bolt, a particularly obstinate one, was driven from its hold. The entire frame was dispossessed of its numerous bolts by the projectile in a much shorter time than a single bolt was ever taken out before. The success of the ordnance tool will mark an important revolution in the work of locomotive repairing.

Correspondence.

Astronomical Theories by an Amateur.

To the Editor of the SCIENTIFIC AMERICAN.

I have an idea in the shape of an astronomical theory, which I would like to unfold, but before doing so, desire to make a brief comment on the liberties astronomers generally take in their theories, by withholding such facts as would tend to cast a shade of doubt on the ideas they put forth.

As an example, take the article in your issue of September 22, by Prof. Lewis Swift, on the subject of the moon. He says the moon has no atmosphere, that it at one time had an atmosphere, which has long since been absorbed by the planet itself.

He does not state why he thinks no atmosphere exists on the moon, but I understand this theory is based upon the fact that none has ever been observed. When a star approaches the disk of the moon, its apparent position in the heavens is not affected by refraction, as would be the case if the moon had an atmosphere. Now, it is a fact rarely mentioned, never dwelt upon, that the moon's atmosphere, if any exist, is very small. It should be in proportion to the moon's bulk as the earth's atmosphere is to the earth's bulk. Astronomers give us no figures as to the size of the atmosphere with which the moon, at this ratio, should be endowed, and the mathematics involved in a computation of this kind is far beyond my caliber, but in round numbers let us assume the earth's perceptible atmosphere is what it used to be, 45 miles high, and that the moon's atmosphere should reach one mile above its surface. The pressure of such an atmosphere at the moon's surface would be less than 1-5 of a pound to the square inch. It would require a delicate instrument to measure the refraction produced by such a thin atmosphere, and letting the proposition rest as it is, it seems to me an assumption indeed to assert that the moon has no atmosphere.

Now, let it be borne in mind that the moon ought to have an atmosphere at the present time, and that if it were not for the fact that it cannot be seen, we would never believe the moon to be so cannibalistic as to devour her own air. But, is it not a fact that the moon's atmosphere, if it has one, would be attracted by the earth in the same manner as the earth's atmosphere and water is attracted by the moon, and in a far greater degree, owing to the earth's greater bulk, and would this not cause almost one-half of the moon's atmosphere to be accumulated around the center of its face presented to the earth, while the other half of the atmosphere would be concentrated on the other side?

The moon causes our tides. If the moon were larger or the earth smaller, these tides would be greater. The earth has a greater attraction for the moon's atmosphere than the moon has for the earth's, and the moon has less attraction for its atmosphere than the earth has for hers. Therefore the atmospheric tides of the moon are enormous; and it is not at all improbable that no atmosphere whatever remains around the edges of the moon's disk, to affect the position of stars eclipsed.

If astronomers can take such liberties with facts in their theories, why not allow a fellow like me a few flights of imagination in a little theory of my own? I believe the main difficulty in presenting a theory is in introducing it. As soon as the wise man reads the proposition he laughs at its absurdity, and rarely proceeds to the arguments put forth to sustain the theorist's position.

You can laugh if you wish, but I have discovered a new planet. I have never seen it any more than Prof. Swift has seen the moon's atmosphere, but it exists all the same. I cannot tell how large it is, but it is pretty big. I will tell you all I know about it:

It belongs to the solar system.

Its orbit is identical with the earth's.

It travels around the sun in the same period of time as the earth.

It sometimes approaches within 184,000,000 miles of the earth. Sometimes it is 190,000,000 miles away from the earth.

It is always in syzygy (I got that word out of a book) with the sun and earth.

The sun is always between this planet and the earth; hence it can never be seen from the earth. But it can be seen from other planets, and perhaps some day, when we have established communication with Mars, we will know more about it. Until then we can only know it is there.

There were gay times on this new planet in 1839, which I intend to tell about.

You know Biela's comet used to make the run from a point out beyond Uranus' orbit to the point which the earth passes November 13. It made the round trip in six and two-thirds years. This comet once had regular habits. It was seen several times prior to 1839, and would have been seen in that year if the position of the sun had not interfered. In 1845-46 it was seen, or rather "it were seen," as the comet was then a double one, each part complete in itself, the two being separated by more than 100,000 miles of space. In 1852 the parts were again observed, and had separated to a distance of more than 1,000,000 miles. This was the last seen of them, and with the exception of a few shooting stars in November, we may never hope to see the same again.

The cause of this comet's behavior has puzzled more than one astronomer, and if you would read the various theories propounded, you would die laughing.

Sir John Herschel said: "Can it have come into contact with some asteroid as yet undiscovered, or peradventure plunged into and got bewildered among the rings of meteorites, which astronomers more than suspect?"

Mars, Jupiter, Saturn, Uranus and the larger asteroids were at the time quite distant from the comet's course.

Nevertheless, the comet parted, and my opinion is it did not part itself. The comet was seen for the last time in 1852, when it reached perihelion September 23. The astronomies to which I have access do not state when it reached perihelion in 1845 or in 1832, so I have to figure from the data I can obtain. It made the round trip in six and two-thirds years; hence in 1839 it would reach perihelion about May 23, i. e., on May 23, 1839, the comet was where the earth would be on November 13. On the same date the new planet would be at the point which the earth passes November 22. Hence a given point in this great solar system is passed by two great bodies nine days apart, the planet having traveled 13,000,000 miles in the interim. Lessen this distance somewhat on account of the attraction which probably exists between all bodies, take into consideration the fact that the comet is traveling in the same general direction as the planet, that its speed is probably sufficient to enable it to overtake the planet in less than twenty-four hours, then get out of the way and prepare for a disintegrated comet!

HENRY W. ENGLISH.

Jacksonville, Ill., Sept. 24, 1894.

Cycling.

The Academy of Medicine of France has taken up for discussion the subject of cycling and its effects on health—the first occasion of the kind in a society purely medical, although one of the greatest moment. It is a singular fact that the learned of the French profession should have led the way in this matter, seeing that the art and practice of cycling have gained so remarkable a place in this country; but it is satisfactory that the subject has been started, for few of medical import are more deserving of study and discussion. In the Academy Dr. Petit—good historical name—opened or took a leading part in the debate. He had met with three fatal cases of persons suffering from heart disease in whom death seemed to be accelerated by the practice of cycling. He also argued that as in the streets of Paris there are at the present time no fewer than 100,000 persons who ride on cycles, and that among these there must be one in every 100 suffering from cardiac disease, the danger of cycling is much greater than is generally supposed. In the young this danger will be, to some extent, minimized; but in persons of middle age, like those to whom Dr. Petit specially referred—one of whom was sixty years and the two others forty years old—there must be a maximum of danger from the pursuit. He held also that among the young who were not suffering from actual cardiac disease the excitement incidental to traveling through the streets of a crowded city, in the midst of the most varied traffic, was of necessity attended with bodily risk, both from external collision and from internal strain and injury.

The testimony thus borne is specially valuable to ourselves, owing to the part which, through good and bad report alike, we have uniformly taken in this controversy. It is many years now since we entered the lists, always with a certain approval of cycling, always seeing that it had a great future before it, always observing that within certain reasonable limits it aided largely as a sanitary pastime, bringing health to those who by its means found themselves able to escape from the close and vitiated air of town life into the pure and life-giving air of the meadows and open fields, and always admitting that in some carefully selected cases of disease it afforded even a method of, or an aid to, successful treatment. We expressed recently what we hope was, and what we think most people have conceded to be, the common sense of the argument. We have warned, as Dr. Petit has warned, riders of all periods of life to be moderate in their application of the pleasure, or pastime, or competition, or work, of cycling.

We have admitted that many of the experiences that have been learned about cycling are among the marvels of the century—the attainment, for instance, of an art that enables a man to compete, not with a horse, but, far beyond that, with a steam engine, coursing away at twenty-five miles an hour. We have treated on some advantages of cycling to the aged, and have shown that the muscles of an octogenarian can be redeveloped to a great extent by the exercise. We have honestly admitted every word that can fairly be spoken in favor of the exercise. But we have given equally honest attention to its faults and dangers, and we shall continue to do so, assured that the profession and the public at large will listen to what we hope is a judicial and altogether unbiased expression, until through the whole of the cycling community sensible reforms and moderate counsels have asserted their power over dangerous competitions and unrestricted enthusiasm.—London Lancet.

Universal Athletics.

From the United States sport has spread throughout Europe; it has gained a firm footing in France, Belgium, Holland, Germany; it is rapidly instating itself in Hungary, Italy, Spain, Switzerland. Upon all rivers glides the light race boat, upon all roads runs the bicycle, and football forces an entrance into all collegiate establishments. The same sun in the course of twenty-four hours lets its light fall upon a boat race in Australia, a football party in Uruguay, and the carriage of President Kruger on his way to Pretoria, Cape Colony, for the celebration of I know not what great occasion, under the escort of eighty bicyclists. It was not without struggle, or at least without protestation, that this conquest of sport was made. Many opponents endeavored to check it and scorned its title to recognition. To some it seemed treason against patriotism; they considered sports as the product of English civilization, because it was in England that they reappeared in the nineteenth century, and the opponents imagined naively that what is called "English sport" must tend to produce Englishmen, or at least Anglomaniacs. In reality, it is but the expression of a human principle, old as the world, and results from the twofold existence in man of spirit and muscle. If there had been two Adams in the terrestrial paradise, I can imagine the first saying to the second, "Let us try our strength; I believe I can run faster than you, jump higher, strike harder." And after their first contest I can fancy the vanquished Adam shaking hands with the victor and then going away to train himself to be in his turn the conqueror.

The much-vexed question of amateurism and professionalism as connected with sports has not yet been settled. Floods of ink have been used in this quarrel without as yet seeming to bring it any nearer to solution. The problem in a modified form existed in old Olympia. In all time some have run for gain, others for pleasure; some have sought money, others glory. But this modern civilization has singularly complicated the matter. Sporting has now become a career; it has its colors, its jockeys, its trainers, and the deplorable betting of the crowd concerning it is one of its regular features. Sporting can only produce good moral effects, can, indeed, maintain its existence, only as it is founded upon disinterestedness, loyalty, and chivalric sentiment. The ancient amateur struggled for a simple branch of wild olive, and law excluded from the contest all the unworthy, all those in whose lives there were any misdemeanors. We are no longer in any danger of seeing the arena transformed by a passion for blood, or the better exhibitions of the stage replaced by the bestialities of the old circus; but there exists as the great corruptor of the present day, as the eternal enemy of all pure sport, the greed for money. Contests in their best form ought to be carried on without any thought of gain. Fencing attests that it is not impossible to reach a high ideal in sports which are absolutely freed from this incentive. A fencer very seldom receives even a medal as his gage of victory. It is thought that to be simply declared victor carries in itself the highest recompense which can be decreed him, the only one which the hand that holds the sword can accept.

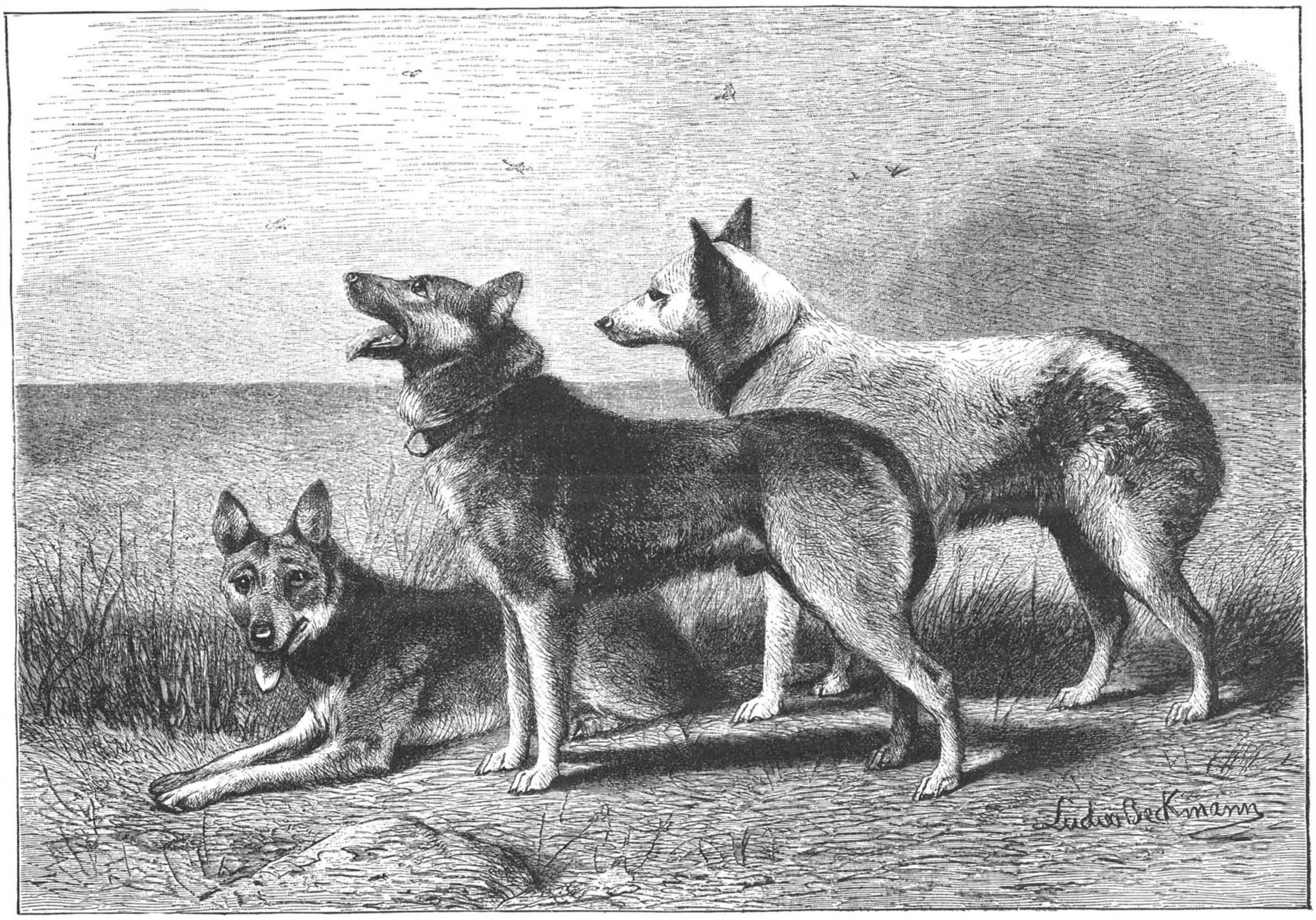
At intervals of four years it is hoped that the twentieth century may see its youth assembling at the great capitals of the world in order to contest with force and skill for the symbolic branch. Without doubt, there are many obstacles to overcome before this new departure shall be reached, among which are, as we have just seen, customs, traditions, race instincts, and all the peculiarities which sporting life borrows from climate, from legislation, from circumstances. But, note well, it will not be necessary to renounce all of these; it will be sufficient to make some sacrifice as to details here and there and to show a little good will toward the international committee which is going to undertake this great work and to attempt to institute in six years the first international contest. Modern, very modern, will be these restored Olympian games. There is no question of reviving the old-time dress and manners; and those who suppose that it will be upon some sacred hill and to the revived tones of the "Hymn of Apollo" that the contest will be waged have only their own imaginations to thank for the mistake. There will be no tripods, no incense; those things are dead, and dead things do not revive. It is only the idea embodied in them that can revive, and it must be adapted to the needs and the taste of the present age. From antiquity we seek to establish only one thing: relaxation, blessed relaxation, which the Greek nations welcomed in order that they might contemplate lasting youth and a future.—Chautauquan, from the Revue de Paris.

GERMAN SHEPHERD DOGS.

Among the many reforms that were taken up throughout Germany soon after the close of the German campaign against France, we may count the efforts to obtain pure breeds of the German dogs. Many know of the good results of this work, the effect of which is more and more evident, but few realize the fact that the most useful of our dogs, the German shepherd dog, has received least consideration, and until lately was thrown far in the background by other German and foreign breeds. The reason for this remarkable neglect was the difficulty in determining the characteristics of the breed. At first it was supposed that there was only one breed of German shepherd dogs, but observation soon showed that there was a most confusing variety of dogs of this type, and many who were interested gave up the attempt to classify them. After investigation and comparison they were divided into three distinct breeds which had been crossed continuously. Thus the way out of the labyrinth was found, and these dogs were distinguished as first, the short, stiff-haired breed; second, the rough-coated breed; and third, the long-haired breed; and now the distinguishing features can be easily recognized from typical specimens. After a great deal of work the commission discovered the marks of the different breeds and published them in the "Deutschen Hund-Stammbuch" (book giving the pedigrees of German dogs).

In 1891 a special club was started, chiefly by Count Cl. Hahn and Mr. Riechelmann, of Grossvahlberg, under the name of the Phylax Society, which gradually directed the work into the right channel. As the majority of the shepherd dogs are owned by shepherds, who, being simple and generally poor people, are satisfied with the usefulness of individual speci mens and are seldom interested in securing pure breeds or in sending dogs to exhibitions, it cannot be expected that many of these dogs will be sent to the international exhibitions, and therefore the Phylax Society determined to connect itself directly with the agricultural associations, and an excellent opportunity for carrying out their purpose was offered by the eighth fair of the German Agricultural Association held at Berlin in June, the directors of which immediately granted the Phylax Society permission to hold a show of shepherd dogs at their fair and appropriated money for extra prizes for the dogs exhibited.

The brilliant success of this show of shepherd dogs promises well for all future exhibitions, and especially for those connected with the agricultural fairs.—Illustrirte Zeitung.



GERMAN SHEPHERD DOGS.

Machine for Asiatic Cotton.

A news item has been going the rounds of the press of an invention by a Southerner for ginning Asiatic cotton. The question has been put to us, says the Manufacturers' Gazette, why any particular kind of ginning or other machinery should be required for this growth of cotton different from that for the American upland varieties. In the first place we will state that the invention referred to is not a ginning machine, but simply one for separating the capsule or pod from the cotton and cleansing the latter. The machine receives in a hopper the capsule or full boll or pod just as it grows on the bush, and delivers the bolls on one side and the seed cotton on the other, practically free from all foreign matter and cleaned ready for the gin. The practical value of this machine has not been fully determined, but one has been sent to Central Asia to be tested near the cotton fields. But little can be said concerning it till these tests have been made. We have had some Asiatic cotton sent to us for examination that was cleansed by this machine, and afterward ginned, and certainly it appeared well for condition and grade (good middling).

The importance of a machine of this kind that will strip the capsule from the seed cotton will be appreciated when it is stated that the capsule of Asiatic cotton (Gossypium herbaceum) has much the appearance of a hickory nut, that it never bursts open like our cotton bolls, but simply cracks, making it exceedingly difficult to extract the cotton from it. The cost of harvesting cotton is thus greatly enhanced. All Asiatic indigenous cotton is alike in this respect, from Asia Minor to Japan. It is to reduce this cost of separation of capsule from the seed cotton and make it a factor of small consequence that this invention is intended to accomplish. Whether it will is yet to be seen.

Paper for Bank Notes.

A fine, transparent, open mesh fabric made of slender but strong threads is passed into paper pulp, made from the best raw materials, while such pulp is moving over the wire in its passage from the stuff vat to the couch rolls and before it reaches the latter. The fabric may be plain or with designs in it. In this state the fabric, lying flat upon the wire, is encompassed on all sides with pulp and passes through the couch rolls, whereupon an intimate combination takes place between and through the meshes of the fabric. It is claimed for the paper thus produced that it offers an absolute bar to imitation and falsification, and that it possesses a high degree of tenacity and durability. —Buttner and Will, Germany.

Georgia Watermelons.

A writer in the Independent states that in Georgia watermelons are planted in hills fourteen feet apart, and from four to six melons are allowed to set on a vine. All these do not mature properly, so that a thousand marketable melons to the acre may be considered a large yield. These will make a carload if they are of average size—that is, weighing from twenty to twenty-five pounds each. Early in the season the grower may realize $125 net for a carload at the point of shipment, but from this point the price runs down until they are sometimes sold out for the freight. Occasionally a grower will go into the refinements of cultivation and allow a vine to perfect only one fruit of some good variety, the others being removed as soon as they are set. Melons weighing sixty or seventy pounds have been grown in this way, and easily marketed at $1.00 each, even when there was a glut of the commoner fruit. The melon most commonly sent North is the handsome variety known as Kolb's Gem, which is a good shipper, owing to its heavy rind, and it is of good quality. Of much finer grain and flavor is the variety known as Rattlesnake, a melon of great length in proportion to its girth at the waist, and curiously and irregularly striped and mottled. In Chattanooga the name of a certain grower was found tagged to every Rattlesnake melon which he had sent, and in an overstocked market, with melons of the same variety selling for almost nothing, those labeled "Dean, Grower," were at once taken up by dealers and consumers at fair prices. There is an obvious moral to this little story. The Rattlesnake melon, having a thin rind, does not endure carriage to Northern markets, although it is largely grown in Georgia for home use. When care is taken in packing a car, however, and the bottom courses are laid in such a manner as to break joints and distribute the weight of the top courses, the crushing of the lower ones is measurably avoided, and melons with a tender shell will carry safely. Melons too small to market, or those which are specked or rotted from contact with the ground, are usually fed to the hogs.

Improved Alloy.

The alloy consists of nickel, 2 to 3 parts by weight, zinc, 10 to 14, and copper 83 to 88. The copper and nickel are melted together and the zinc afterward added. The alloy is manufactured into wire in the usual manner; and the object of the above composition is to diminish the liability to corrode in making endless wires for paper-making machines and other purposes.

THE LOWE OBSERVATORY.

A new astronomical observatory has been established in Southern California by Professor T. S. C. Lowe, the projector, builder, and president of the Mount Lowe Railway, an illustrated description of which was published in our issue of February 3, 1894. Its location is seven miles by rail north of Pasadena and sixteen miles northeast of Los Angeles, the rapidly growing metropolis of the Southwest.

The new observatory is well equipped with the great 16 inch Clark refractor and other instruments, which have done notable work in the Warner Observatory at Rochester, under the directorship of the eminent astronomer Dr. Lewis Swift. The buildings consist of a central tower 32 feet in diameter, surmounted by a light dome, and two unequal wings—the smaller containing a dark room for photographic work and the larger furnished with cases for the extensive astronomical library of reference gathered by Dr. Swift in the course of his professional career. A large platform in front will have ample room to manipulate the comet seeker, and to accommodate the throngs of visitors who will claim his attention on stated occasions.

The Sierra Madre Mountains, upon which the Lowe Observatory is located, have an east and west trend, and rise abruptly from the San Gabriel Valley on the south to an altitude exceeding 6,000 feet above sea level. The observatory is built upon a southern spur of these mountains, about 150 feet higher than the Echo Mountain House, reached by the Mount Lowe Railway, and half a mile west of it. Its altitude is about 3,600 feet above the sea and 2,000 feet above the foot hill mesa at the base of the mountains, which are very steep at this point. While the crest of the range rises high above the observatory and shelters it on the north, leaving, however, the north star visible, the entire southern horizon is unobstructed, extending to the rim of a large segment of the Pacific Ocean, about 100 miles distant on the south and west. Astronomically it is nearly at the intersection of 34th parallel of north latitude with the 118th meridian of longitude west of Greenwich. This very low latitude, combined with a high altitude, gives Dr. Swift a zone of the celestial sphere ten degrees wide not visible from his Rochester Observatory, and his longitude enables him to observe celestial objects three hours after they are below the horizon at the Harvard Observatory. One advantage of his new location was made manifest a few weeks ago while he was searching for comets near the southern horizon, when a star of the second magnitude whose identity was unknown to him entered the field of his telescope.

Referring to his charts, he discovered that it was the most northern star in the famous constellation of the Southern Cross.

Besides the ten degrees of south latitude at the Lowe Observatory not commanded by Dr. Swift at Rochester, he now possesses other advantages which must be fruitful of important scientific results. The large proportion of clear nights will enable him to make continuous and uninterrupted observations. When a new discovery is made, whether a comet, an asteroid, a nebula, or a new star blazing forth from the depths of space, he will be able to follow it night after night with telescope and spectroscope and camera, and catch and hold the celestial object in all its varying phases and motions.

But besides an unclouded sky, there is a peculiar clearness in the atmosphere.

Three-fourths of a mile of the densest portion of the atmosphere, with its dust, fog, haze, and other impurities, is below the observatory and Dr. Swift is able to use much higher powers on his instruments at all times than he could under the most favorable conditions at Rochester, thus vastly increasing the efficiency of their use.

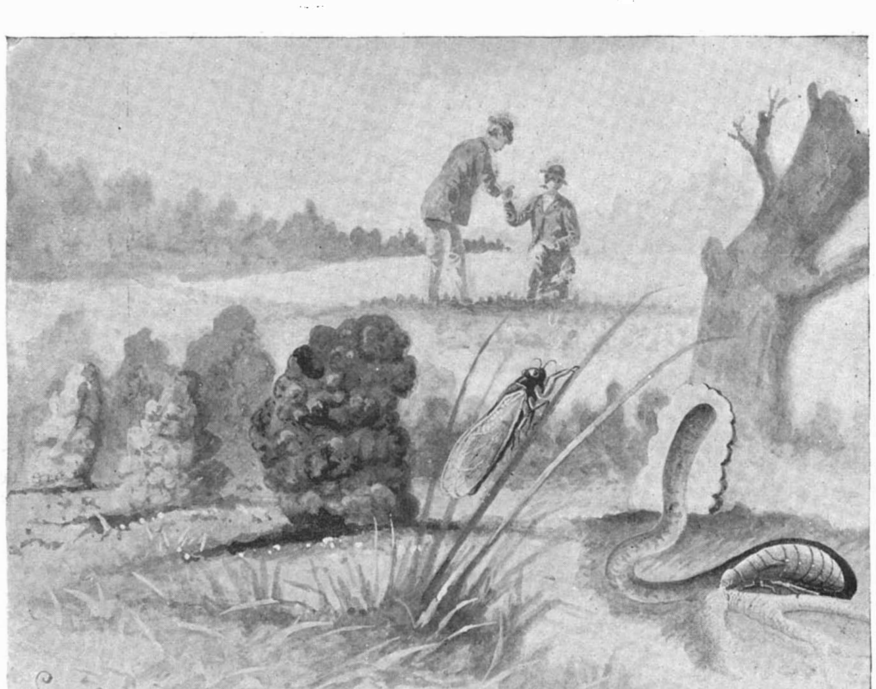
Another advantage not to be overlooked is the equable temperature of Echo Mountain. As the astronomer cannot permit artificial heat in his observatory, the exposure in cold weather is very trying. At Rochester he was sometimes enveloped in three great coats, besides wrapping his lower limbs in blankets and rugs, which impeded his motions as well as benumbed his senses. At Echo Mountain the mercury seldom descends to 40 degrees Fahrenheit, and his mental powers will always be on the alert.

Dr. Swift has been the recipient of many distinguished honors from eminent institutions in America and Europe. Three gold medals were awarded by the Imperial Academy of Science at Vienna for comet discoveries in 1877, 1878, and 1879. The Lalande prize, valued at 500 francs, and a silver medal were given by the French Academy of Sciences in recognition of the rapidity of his astronomical discoveries in 1881. The bronze medal of the Astronomical Society of the Pacific was awarded for the discovery of the famous many-tailed comet of 1892.

But brilliant as are his achievements in the discovery of comets, they are almost insignificant when compared with the work accomplished in an entirely different field of investigation. Dr. Swift has discovered and catalogued more nebulæ than any other living astronomer. The number of these faint, elusive, tantalizing, and highly interesting objects first detected and accurately described by him now reaches the surprising total of 960. Only the two Herschels, father and son, surpass this record. Sir William began his researches more than a century ago, and Sir John had the advantage of several years' residence in South Africa, thus placing the entire southern hemisphere under his scrutiny.

WM. H. KNIGHT.

Los Angeles, August 28, 1894.



HUTS OF THE SEVENTEEN-YEAR CICADA.

DR. LEWIS SWIFT.

HUT-BUILDING SEVENTEEN-YEAR CICADAS.

AN ATTEMPT AT AN EXPLANATION.

BY BENJAMIN LANDER.

At the recent convention of the American Association for the Advancement of Science, held in Brooklyn, much interest was shown in the life-history of the seventeen-year cicada (" locust "). One of the most interesting papers read treated of the remarkable earthen huts which, in rare cases, are built by the pupæ on the surface of the ground, serving as a domed extension of their underground burrows. It was stated that no satisfactory explanation of the causes that occasioned their construction, their uses, or why they are so exceptional has been offered.

During the late invasion of the Hudson valley by the grand army of cicadas, the writer had unusual opportunities to study the habits of the insects; and having been so fortunate as to discover a vast "locust" city of adobe huts near his home, his observations seem to offer clews to the solution of the three mysteries alluded to. But before stating them a more explicit allusion to the phenomenal Liliputian city might be of interest; indeed, the peculiarities of its locality bear directly upon the tentative explanation of their construction.

On the fourth of May, while passing over a burnt section of the woods on South Mountain, near Nyack-on-the Hudson, great quantities of small, irregular earthen protuberances were observed on the surface of the ground, extending in every direction. To one acquainted with the literature pertaining to seventeen-year cicadas, their origin was manifest: they were the wonderful huts of those insects.

There was no exit, and on breaking them off they were found to be built in continuation of the burrows of the pupæ. In height, they varied from one to four inches. Some were very symmetrical, even beautiful, especially when built of clay impregnated with a rich red iron oxide.

The area of the original discovery extended over about two acres, the huts gradually disappearing as the ground dipped to a deep gully—a miniature valley, three or four hundred feet wide, an important fact in the attempt to explain their cause. Subsequent explorations beyond the gully revealed a wide extension of the mysterious structures, a conservative estimate making the aggregate area where they abounded at least sixty acres. Almost every square yard had more or less of them; frequently eight or ten to the foot. In one case twenty-three were counted in this small space, many of them joined externally; the separating walls of the chambers in some cases not more than an eighth of an inch thick. So populous was this marvelous city that in August the writer collected and preserved in balsam over sixty thousand larvæ, hatched from eggs deposited in the twigs of four or five trees.

Professor C V. Riley, late government entomologist, in a recently published article, attempts to explain the mysteries of the huts on the supposition that they are built (when on low ground) to protect the burrows from the inflow of water, but admits an objection in the fact that they are also found on high and dry ground, and suggests that in the latter case they are constructed by the progeny of cicadas which had built in low, damp places, the inherited building instinct remaining through the lapse of years—a theory which, in the light of observations made during the recent appearance of the insects, seems quite untenable. In the same article it is stated that "the tubes are generally closed at the top, with an orifice at the surface of the ground"—a statement which seems inexplicable, save on the ground that it was based on the word of some superficial observer.

Out of countless thousands of these buildings seen by the writer, not one had an orifice at the surface of the ground at any time; repeated visits to the hut areas after the emergence of the pupæ showed that in every instance the exit had been made at the top, and was only large enough to emit the insect. Among the many specimens collected is one unusually interesting. Its little builder had made a miscalculation, had clawed out a hole a trifle too small, but was able to get far enough out to split its shell, emerging a perfect cicada; the cast-off case remaining a fixture in the orifice. Occasionally there would be a roofless tower among the multitude of structures, but it was perfectly apparent that it had been left unfinished, as the opening at the top was in each case the exact width of the burrow; the pellets showing on the rim that it was not broken. Doubtless the little architect had been surprised and captured at his belated work by some "early bird" or other forager.

All of the large aggregations of structures observed by the writer were on high ground (a small one of importance will be alluded to later), and were not subject to overflow. They were either on the top of lofty hills or on the Palisades. All were finished, were discovered very early, and must have been built in April, considerably in advance of the open burrows of the rest of the great brood. Some were on ground that had been cleared since the 1877 swarm—quite destitute of dead leaves, or anything that would retain moisture; in every case remote from low levels.

It is well known by observers that the Cicada septendecim, ulike its congener, Cicada canicularis, or harvest fly, is extremely inert, its flight very short; and it is beyond the bounds of possibility that these high-ground builders were the progeny of low-ground builders who migrated in a body to the elevated places in order to deposit the eggs from which this year's pupæ were hatched; for unlike the grasshopper, they neither migrate nor fly collectively.

It is also well known that the Palisades and the hills on the west shore of Tappan Bay are identical in their origin, having been squeezed up in a plastic state from below by some tremendous convulsion of nature, and their tops are more or less smoothly ground by the mighty glaciers of past ages, the mould accumulated upon their highest parts varying from a few inches to three or four feet, while in many places the massive trap rock crops above the surface.

It will be remembered that the month of April was phenomenally hot. It seems no great flight of the imagination to suppose that the pupæ in the shallow earth covering the smooth, unbroken and impervious rock would be early stirred to activity by the unwonted heat, and would build their burrows to the surface in advance of those in deeper and cooler ground; obeying the same impulse that the latter would feel when the warmth of the more advanced season would reach their more remote abiding places and stir them with new life. Especially would this be so where the woods had been recently burned over, as was the case with several hut localities observed by the writer. The undeveloped state of the pupæ of these domed burrows is shown by their size, which, in those collected during the first week in May, is only about two-thirds that of those which emerged fully grown some three or four weeks later.

It does not seem unlikely that the wonderful intelligence of these marvelous creatures, apparent in so many ways to those who have carefully observed their habits, would impel them to build closed extensions to their short burrows as a protection from the premature heat; which purpose would, in some measure, be served, and possibly, to shut out injurious intruders during the incidentally lengthened period they would have to wait for full development over that of those who would later open their deeper shafts, unroofed, at the surface of the ground; the covered huts rendered more or less durable by the admixture with the fine earth composing them of a waterproof cement exuded by their builders. Equal intelligence in combating actual vicissitudes, and foresight for contingencies, in other creatures of the lower orders will present themselves to the mind of any naturalist.

The theory that the heat of the thin crust of earth covering the widely extended, smooth rock had something to do with the early appearance and hut building of the pupæ it contained is rendered well nigh conclusive by the fact that the deep gully previously referred to as crossing the large cicada city was entirely free from the buildings, for there the earth is much deeper, as in all such places, by reason of the great accumulation of alluvial detritus. Here, at a later period, the ground was honeycombed with open unhutted shafts. Could anything be more conclusive?

Only in one case was any considerable aggregation of these structures observed on low ground, and that was very early in the season and in a dry locality, but the feature that bears out the heat and shallow burrow theory is the fact that it also was on thin ground, covering a massive foundation of old red sandstone, adjacent to a quarry, where the thin earth covering was in evidence.

Indeed, all of the aggregations noticed—nine in all, varying from half an acre to sixty acres—were over extensive masses of smooth impervious rock, permitting no deep burrowing, so thinly covered with earth that in many places it could be uncovered with an ordinary garden trowel, deepening to and below the average frost line.

Thus it would happen that the same thermal conditions would act alike upon the vast numbers of pupæ within the affected area. Not an open burrow was seen in any of the hutted spaces. Indeed, among the few, even individuals, situated in like manner, the effect would be the same; and it is presumable, in view of the uniform physical features of the localities where these huts abounded, that like conditions obtain in other places whence similar discoveries of these remarkable structures have been reported.

Only twice have these huts been mentioned in the literature pertaining to the periodical cicada, and hitherto but one specimen was known to be in any museum. The cause of their phenomenal appearance this year can only be explained, it would seem, by the unusual and intense heat of April; the instinct (why not say reason?) of the hut builders being all-sufficient to meet the exigencies of exceptional environment.

Josiah Parsons Cooke.

Josiah Parsons Cooke, for many years an associate editor of the American Journal of Science, was born in Boston, October 12, 1827, and died in Newport September 3, 1894. When he was a student in Harvard College the chemical department was so thoroughly disorganized that his teaching in this branch was confined to a few disjointed lectures, and to these he added after graduation some months of study with Regnault, in Paris. With these meager exceptions, his chemical knowledge was acquired by his unaided efforts, and these had been so successful, even in his boyhood and youth, that at twenty-two he was appointed Ewing Professor of Chemistry and Mineralogy in Harvard University, a position which he held till his death.

As a teacher he has had a deep and lasting influence on the characters of a multitude of students by means of his elementary lectures given for over forty years to the whole of each class which has passed through Harvard College; and his advanced students have drawn from him the best instruction and inspiration. The chemical department of Harvard College he has raised from the state of entire collapse, in which he found it, to one of the strongest and best equipped departments in the college, established in one whole building and part of another, both of which, together with the rich mineral cabinet, were presented to the college principally through his exertions.

But his influence was not bounded by the college walls; his brilliant popular lectures have spread a taste for science and a knowledge of chemistry in the outside world, and his numerous books, ranging from abstruse college text books to popular expositions of his favorite subject and scientific essays, have reached even a wider audience.

These labors have met with recognition by his election to numerous learned societies, and especially by the degree of doctor of laws, which he received from the University of Cambridge, England, and by his selection as president of the American Academy, a position which he held at the time of his death.

The eminence of which I have tried to give an outline was due to his complete and loving devotion to his chosen science, his brilliant talents, his remarkable executive ability, and to his ceaseless and unwearied industry. He leaves a gap in Harvard University and the scientific world which it will be hard to fill.—American Journal.

Pins.

An article in a recent number of Machinery, by Mr. Fred H. Colvin, contains some interesting particulars.

The manufacture of pins was one of the first mechanical industries which engaged the attention of our forefathers, for as early as 1775 the colony of Carolina offered prizes for native-made pins, and a factory was started in 1812, but failed. Twelve years later Mr. Lemuel W. Wright, a native of Massachusetts, was granted a patent in England for a pin-making machine, but this, for some reason, was not introduced into the United States; and in 1842 Dr. John T. Howe, a New York physician in charge of an hospital, whose convalescents occupied their time by making pins by hand, determined to introduce into America the manufacture by machinery of these small articles. After a period of careful study, during which time he acquired knowledge of their manufacture, he returned to this country, bringing with him the necessary machinery for a factory, and founded what is now the Howe Manufacturing Co., of Birmingham, Conn.

The ingots, or bars from which the pins are finally made, are cast in iron moulds, and are about 1½ by 3 inches and 6 feet long, being a mixture of two parts copper to one part zinc. By continuous rolling and frequent annealing these bars are reduced to sheets about one-eighth of an inch thick, and then passed between rollers which slit them into small square strips ready for drawing. The process of drawing is well known, dies of different sizes being provided, and by continuous drawings and annealing the wire assumes the right diameter for pins.

When it reaches the pin department proper the wire must first be straightened, as on the small reels it takes a permanent set, which is not allowable in the pin machines. From the small reels it is wound to the standard pin machine reel, 22 inches in diameter, at the rate of over 1,000 feet per minute, passing through a combination of horizontal and vertical straightening rolls, which effectually take out the kink and leave it ready for the pin machine. The reel is now placed on the rack beside the pin machine, and rollers draw the wire into the machine, where it is first cut off, then headed by three distinct blows, given by a cam and toggle.

The headed blanks are carried down on the surface of a vertical wheel, to horizontal disks below. Here they pass between the two disks and are revolved by one running much faster than the other, at the same time being moved to the left over revolving steel files, four in number, which make the points, finishing with an emery belt. These machines are speeded to make 160 pins per minute, and fifty machines work in one room. As these machines require practically no attention, they are run about fourteen hours a day, and the number of pins made, allowing for stoppages, will exceed 5,000,000 per diem, the aggregate weight being from 1,200 to 1,500 pounds, according to size; the different sizes varying in weight from 1,100 to 18,000 to the pound.

The pins then travel to the tinning room, where they are tumbled with sawdust for ten minutes to remove all oil and dirt, boiled for four hours with pure Banca tin, in a prepared solution, and after a bath of strong soapsuds to give them a smooth surface, a final tumbling with sawdust makes them ready for the sticking room. Once there, they are dumped into the hoppers of the sticking machines and thence pushed out by revolving fingers to an inclined bed with radial slots, or "runs," into which large numbers of the pins fall, some being caught by the head, others escaping through openings to a pan below to be replaced in the hopper at leisure. The pins feed down these slots and drop in the "cutting-off" plate as it is moved slightly across the row, and when full the movement of a lever drives the small hammers down, forcing them into the paper, which is crimped at the same time and held for the sticking. These power sticking machines were designed by Mr. Naramore in 1884, and have as many runs as there are pins in the row, the ones for cut sheets having 30 pins to the row and 12 rows to the paper being used in this machine, the attendant sticking about 2,400 sheets per hour.

Some of the sticking machines similar to the ones shown are adapted for the cheaper pins, which are stuck into continuous rolls at the rate of 100 rows a minute and cut up into the required lengths after they leave the machine. These machines need very little attention, filling the hopper and renewing the rolls being all that is required. About the only feature of the business which has not changed is the style of putting up the pins, the old numbers of 14 rows of 20 each for cheaper pins and 12 rows of 30 each for the better grades still being used.

Fifty years ago when Mr. Joseph Naramore was a boy in the pin factory at Birmingham, Conn., the pins were put into the paper by hand, the creases being rolled in by a machine, and the pins and paper were taken home by the farmers to do evenings, being paid at the rate of six cents per dozen papers. Next came the hand machines shown, having a single slot or "run," in place of 20 or 30, as are now used, and having a "cutting-off" plate and hammers much as in the latest machine, being operated by the levers at the side of the machine.

The first pins were made with wrapped or spun heads, the solid or "upset" head not being satisfactorily accomplished until it was discovered that two or more blows were necessary, and three has now become universally the practice. The firm of Wallace & Sons had its origin in 1848, and has grown so that the pin department is a small portion of the whole, the electrical industries having created an immense demand for copper wire in various forms, and this forms probably their largest department.

New Signaling Apparatus.

A new signaling apparatus, the joint invention of Prince Louis of Battenberg and Captain Percy Scott, of the ordnance committee, has been fitted for trial on board the Insolent at Portsmouth, England. The advantages claimed for it are clearness, certainty, and rapidity in the transmission of orders by the Morse system of telegraphy. It consists of a collapsible canvas sphere constructed with ribs somewhat like an umbrella, and is made to open and close by means of movable collars attached to the mast. The collars are connected with rods which pass through the interior of the mast to the lower deck and are actuated by levers worked within the protection of the side armor in battleships or beneath the protection decks of cruisers.

Peary in Greenland.

Lieutenant Peary has heroically remained in Greenland to carry on the work of exploration for another year. To any one familiar with Arctic exploration the situation is perfectly clear. As has happened often enough in the past, the weather and conditions of one season have proved no criterion of the weather in a succeeding season. Kane pushed the Advance north into Smith Sound with little difficulty. For the next two years the ice was solid about the vessel. His second summer he was able to leave the vessel in boats. The first summer his exploring party was stopped, its members frostbitten, and the Advance turned into a hospital by a storm which was precisely like that which overwhelmed Lieutenant Peary on his trip to Independence Bay on a track which he crossed with no danger whatever two years before. The vessel which took up the Greely party went the length of Smith Sound and beyond as easily as a vessel goes up the St. Lawrence in summer. The vessel which went to Greely's relief was crushed before it entered Smith Sound.

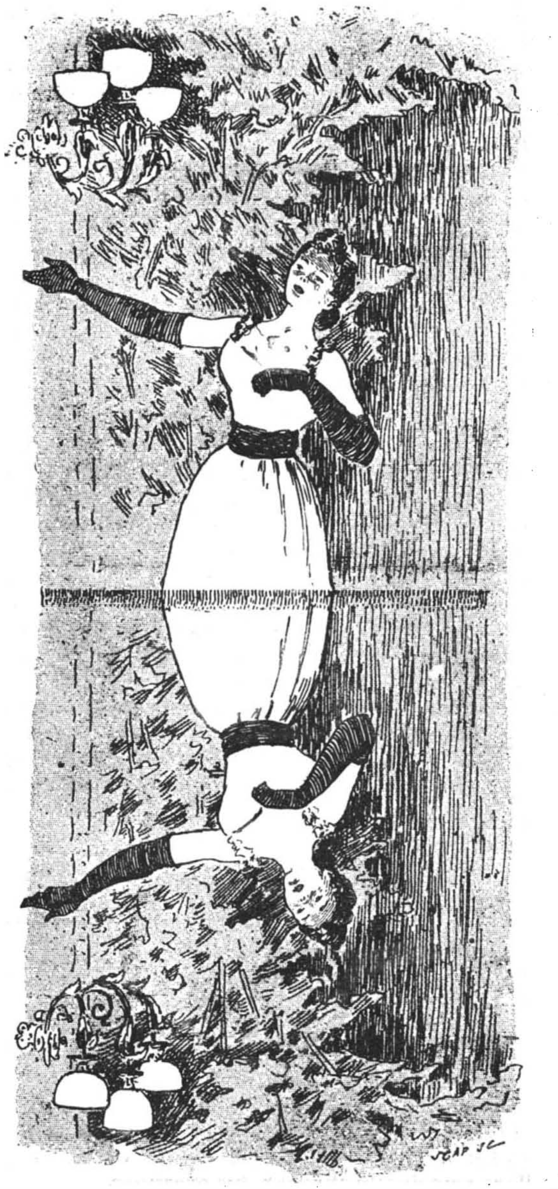
These are the constant risks and hazards of Arctic exploration. In a year of general disaster Lieutenant Peary has faced them all with success. His theory that northern exploration is safer on the ice cap than elsewhere is demonstrated by his safe return after the most terrible storm recorded in Arctic annals as much as it was proved by his success in crossing Greenland in 1892. In a good season, on this route, extended exploration is possible and in a bad season a safe retreat. With the daring, energy, and perfect self-command he has always shown, he has used his advance this year to cache supplies for his advance next summer. In the interval between his return to the coast and the appearance of the Falcon he was accumulating supplies with an energy which suggests what might have been done by other Arctic parties in the same region. No previous explorer has recorded a tidal wave such as destroyed part of his stock of fuel, the tides being unusually stable on the Greenland coast. Even with this disaster the expedition endured nothing not familiar in all Arctic expeditions. In short, Lieutenant Peary has shown the same ability in the face of untoward conditions which he has displayed under more favorable circumstances.—Philadelphia Press.

ARTIFICIAL MIRAGES.

Midsummer is the season that in our climate most readily permits of the observation of mirages. As well known, what we designate by this name are symmetrical and inverted images of objects that are seen, under certain atmospheric conditions, as if reflected from sheets of water. The phenomenon is frequent upon the plains of Egypt. It gives rise to the most startling illusions, and we well know the cruel deceptions that, during the campaign in Egypt, were experienced by our soldiers when, in the extreme heat of the day, they ran exhausted by thirst and fatigue toward the villages that they saw emerging from large chimerical lakes. Such distresses were good for some thing at least, for we are indebted to them for the first scientific explanation of the phenomenon, which was given by Gaspard Monge. Struck by the rays of the sun, the sand becomes exceedingly hot, and the heat is communicated to one after the other of the different strata of air, but it is those that are nearest the earth that are the hottest and lightest. The heat and lightness of the strata continually diminish in ascending.

If a luminous ray, such, for example, as that which is emitted by the top of the palm tree of our figure, traverses them from top to bottom, it will be more and more deflected from the vertical by the lighter and lighter strata. Its behavior will be just the reverse that of the ray that is sent to us by the sun, and which, traversing heavier and heavier strata of air in measure as it draws near us, tends every time to approach the vertical and makes the orb appear to us further above the horizon than it really is. In short, our luminous ray, through the curved route traced in the figure, will finally meet the surface of separation of two strata, and, as it will meet this almost in grazing it, it will not traverse it, but will be reflected, and thus, in rising, reach the eye of the observer, who will see the image of the object upon the prolongation of the ray (that is to say, inverted and symmetrical upon a white background due to the brightness of the sky), and having the appearance of a beautiful lake. Our figure represents an experiment that has recently been made with a view to reproducing a mirage by photography.

A very even plate of sheet iron is taken and placed horizontally upon two supports. The plate is heated very uniformly and sprinkled with sand. Then a small Egyptian landscape is arranged at one end of the plate and the eye or the photographic instrument is so placed that the visual ray shall properly graze the



A MIRAGE IN A CONCERT HALL.

plate. A mirage can be obtained still more easily, when the air is very calm, by lying flat upon the stomach upon a road or well heated sandy lane. In placing the eye very near the ground one can obtain an inverted and symmetrical image of sprigs of grass, pebbles, etc. This is a diversion that may agreeably break the monotony of long hours of revery in the country.

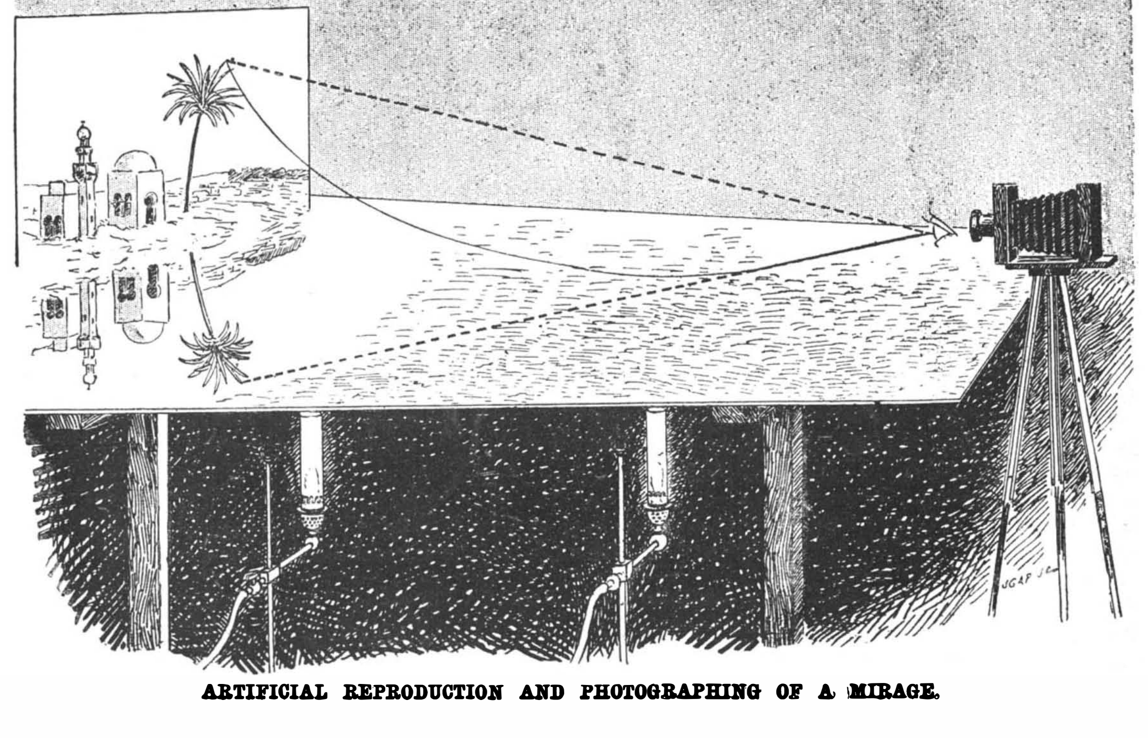
In a music hall and in well-lighted places, in the evening, it is thus possible to vary an often monotonous show and create new surprises for one's self. With the greatest care, and without mixing them, superpose in a glass two liquids that are capable of gradually uniting at their surface of separation, such, for example, as water and lemon sirup. Now look at the diva through the stratum of the liquids that have just mixed, and the spectacle will be fantastic. Our figure is capable of giving but a very incomplete idea of it. This experiment, like the one first described, is a practical demonstration of Monge's principle and of the value of his explanation.—Le Monde Illustre.

The Japanese Victory.

The first serious engagement between the Chinese and the Japanese forces in Corea has resulted, as competent judges have foreseen all along, in the complete victory of the latter. The strong position of Ping-Yang, lying north of the Tatong River, on the road from Seoul to Mukden and Pekin, was carried by assault in the small hours of Sunday morning, September 16, 1894. The Chinese troops who held it, to the number, it is reported, of 20,000 men, were routed with a loss in killed, wounded, and prisoners estimated at four-fifths of their entire force. The residue are said to be scattered in all directions, and the victors are stated already to have dispatched a flying column to seize and occupy the passes between Corea and China to the north. There never was much question that, if the Japanese could manage to get to close quarters with their opponents before the winter set in, they would succeed in inflicting upon them a severe defeat. It has long been known, on the authority of military experts, that their infantry and artillery at any rate are in a high state of efficiency. The men themselves are hardy, active, brave, and intelligent. Their drill and discipline have been carefully adapted from the best European models. Their arms are of the latest and most destructive patterns that science has devised, and every detail in their equipment and accouterments has been thoroughly thought out and carefully provided. The officers who have had the skill and the energy to create such a force are, it need hardly be said, worthy to lead it. All of them have made a scientific study of their profession, and some among them have devoted themselves to a close investigation of the more famous European military systems, under the guidance of distinguished strategists. But, while it was evident that such an army, so led, would have an easy task in defeating and dispersing any force which the Chinese were likely to assemble against it at short notice in Corea, it was by no means certain that the Japanese could force on an engagement before the Corean winter made serious operations impracticable. The Japanese commander has shown that he has mastered the great secret of modern warfare. He has known how to move his troops with rapidity and with precision, and by doing so he has succeeded in dealing what is undoubtedly a heavy blow to China with trifling loss to himself.—London Times.

Velvo-Carbon Batteries.

By invitation of the Battery and Motor Company, a number of scientific experts were present lately at the company's works, on Petersham Island, Richmond, to witness the application of the velvo-carbon principle to launch propulsion. The Velvoca, which has been specially built, is a 35 ft. open boat, and has a beam of 6 ft. 6 in. The batteries, weighing 14 cwt., are placed in the center, and have a cover which can be utilized for a seat, so that no space is wasted. Velvo-carbon, it should be stated, is a special class of negative electrode for electric batteries, consisting of ordinary carbon with a surface of carbonized cotton velvet. Batteries employing these carbons were shown to be both light and powerful, and may be used with a weak solution of sulphuric acid only as an excitant. The patent incorrodible connections are made of pure silver or platinum, and owing to their form, are cheaper than the connections used hitherto, both in first cost and in maintenance. Trial was made of the Velvoca at full speed and at half speed, and it was stated that she could be charged to run for a few hours at half speed if so desired. It is claimed that velvo-carbon for electric launches possesses many advantages over the existing system.



ARTIFICIAL REPRODUCTION AND PHOTOGRAPHING OF A MIRAGE.

Recent Eruption of Kilauea.

This great volcano has been active for several months past, the principal characteristic being a remarkable rise and fall of melted lava within the crater. L. A. Thurston gives the following among other particulars in the Pacific Commercial Advertiser. In March, 1894, the lava had risen almost to the top of the crater, the rise being 447 feet in 19 months.

On the evening of July 6, a party of tourists found the lake in a state of moderate activity, the surface of the lava being about twelve feet below the banks.

On Saturday, the 7th, the surface of the lake raised so that the entire surface was visible from the Volcano House. That night it overflowed into the main crater, and a blow hole was thrown up some 200 yards outside and to the north of the lake, from which a flow issued. There were two other hot cones in the immediate vicinity which were thrown up about three weeks before. On Sunday, Monday and Tuesday, July 8, 9 and 10, the surface of the lake rose and fell several times, varying from full to the brim to 15 feet below the edge of the banks.

On the morning of the 11th the hill was found to have sunk down to the level of the other banks, and frequent columns of rising dust indicated that the banks were falling in. The lake had fallen some 50 feet, through the escape of the lava by some subterranean passage, and the wall of the lake formed by the hill was falling in at frequent intervals.

The lava in the lake continued to fall steadily, at the rate of about 20 feet an hour from 10 o'clock in the morning until 8 in the evening. There was scarcely a moment when the crash of the falling banks was not going on. As the level of the lake sank, the falling rocks of the banks, undermined by the escape of the lava, caused a constantly increasing commotion in the lake as they struck the surface of the molten lava in their fall. A number of times a section of the bank, from 200 to 500 feet long, 150 to 200 feet high, and 20 to 30 feet thick, would split off from the adjoining rocks, and with a tremendous roar, amid a blinding cloud of steam, smoke and dust, fall with an appalling down-plunge into the boiling lake, causing great waves and breakers of fire to dash into the air, and a mighty "ground swell" to sweep across the lake, dashing against the opposite cliffs like storm waves upon a lee shore.

Most of the falling rocks were immediately swallowed up by the lake, but when one of the great downfalls referred to occurred, it would not immediately sink, but would float off across the lake, a great floating island of rock.

As the lava subsided, most of the surrounding banks were seen to be slightly overhanging, and as the lateral support of the molten lava was withdrawn, great slices of the overhanging banks on all sides of the lake would suddenly split off and fall into the lake beneath. As these changes took place the exposed surface, sometimes 100 feet across and upward, would be left red hot, the break, evidently, having taken place on the line of a heat crack which had extended down into the lake.

From 6 to 8 o'clock the entire face of this bluff, some 800 feet in length and over 200 feet in height, was a shifting mass of color, varying from the intense light of molten lava to all the varying shades of rose and red to black, as the different portions were successively exposed by a fall of rock and then cooled by exposure to the air. During this period the crash of the falling banks was incessant. Sometimes a great mass would fall forward like a wall; at others it would simply collapse and slide down, making red-hot fiery landslides; and again enormous bowlders, as big as a house, singly and in groups, would leap from their fastenings and, all aglow, chase each other down and leap far out into the lake.

The awful grandeur and terrible magnificence of the scene at this stage are indescribable. As night came on, and yet hotter recesses were uncovered, the molten lava which remained in the many caverns leading off through the banks to other portions of the crater began to run back and fall down into the lake beneath, making fiery cascades down the sides of the bluff. There were five such lava streams at one time.

The light from the surface of the lake, the red hot walls and the molten streams lighted up the entire area, bringing out every detail with the utmost distinctness, and lighted up a tall column of dust and smoke which arose straight up. During the entire period of the subsidence the lava fountains upon the surface of the lake continued in action, precisely as though nothing unusual was taking place.

Russian Iron Production.

A consular report issued recently on the iron industry of European Russia states that during the past twelve years the output of pig iron has more than doubled, rising from 460,000 tons to 1,060,000 tons, and the combined output of wrought iron and steel has risen from 575,000 tons to 1,000,000 tons. A notable feature is the increased pace at which the production rises during the closing years of this period, marking the decisive expansion of the home industry at the expense of imports. Thus, pig iron rose at the rate of 16,000 to 24,000 tons a year up to 1886, after which the yearly increase is 48,000 to 80,000 tons, and from 1889-90 to 177,000 tons. Steel fell after 1881, an abnormal year, owing to the issue of great government orders for steel rails; shows no advance from 1883-89, but between 1889-92 rises from 253,000 tons to 516,000 tons. Wrought iron is stationary from 1884-88, and rises constantly up to 1892. A corresponding movement is noticeable in imports of pig iron, which from 1886-91 fell from 258,000 tons to 80,000 tons, and of wrought iron, which rose up to 1890, and from 1890-92 fell from 93,000 tons to 49,800 tons. The import of steel rose up to 1890, and from 1890-91 fell from 16,000 tons to 12,900 tons. While the gross production of steel rose from 1882-92 from 242,000 tons to 516,000 tons, the manufacture of steel rails shows little change (153,000 tons in 1882 to 182,000 tons in 1892). Nearly half the total weight of steel prepared in Russia is used in the manufacture of steel rails.

RECENTLY PATENTED INVENTIONS.

Engineering.

INCREASING CRANK THROW OF STEAM ENGINES.—Henry I. Schanck, Holmdel, N. J. According to this improvement there are two cranks on the main shaft joined by a heavy wrist pin on which are two eccentrics, and on the outer end of the piston rod is a longitudinally channeled and slotted crosshead, there being a heart-shaped cam block in the channel, a transverse cam shaft fast in the cam block and loose in the slots of the crosshead, while there are guides for the crosshead, cranks on the ends of the cam shaft, rods between the cranks and the eccentric straps, and a main forked connecting rod. The improvement is more particularly applicable to high pressure, quick speed, horizontal and upright engines, and is designed to increase their efficiency.

SECTIONAL BOILER.—Harry A. R. Dietrich, South Bethlehem, Pa. This is an improvement on a former patented invention of the same inventor, the improved boiler being designed for steam or hot water heating, and particularly adapted for heating buildings by hot water circulation. A particular feature consists of a hollow bottom wall, affording an extended heating surface which receives heat from the ash pit and from a central heat conduit, and there are throttle gates so controlling the heat currents that increased absorption is secured for the water in the legs of the boiler sections. The main heat conduit and flue connections insure extended contact of the heat currents with water-heating surfaces, increasing the efficiency of the boiler and conducing to economy of fuel.

STEAM BOILER.—Harry H. Kelley, Elyria, Ohio. This boiler has a steam drum from which depends a shell containing a cylinder perforated at its lower end and adapted to receive the feed water, there being a specially constructed water circulating pipe exteriorly on the shell. The shell is made in sections, heads held on the end sections being connected with each other by stay bolts, the upper head opening into the bottom of the boiler, and the shell depending into the boiler furnace, while the cylinder is suspended within the shell from the lowermost head.

Railway Appliances.

TIE PLATE.—Walter H. Wilson, New York City. This is a plate for preserving wooden ties by preventing checking, etc., and also preventing the rail from shearing or grinding the spike heads. The plate has on its upper surface a rail seat and its under side is concaved in a direction longitudinal with the rail seat, while there are cutting edges at the sides of the concave for entering the tie. The plate is of comparatively light weight, has spike holes, and the metal is upset in such a way that the plate may be quickly and securely applied and will embed itself in the tie.

APPLYING HOSE TO COUPLINGS.—Peter Whyte, Meridian, Miss. For connecting air brake pipes this inventor has devised a simple and efficient apparatus for applying the screw clamps which fasten the hose sections to the nipples. Combined with a reciprocating hose clamp having tapered jaws fixed on yielding arms, whereby they are adapted to move toward or from each other laterally, is a tapered socket adapted to receive the jaws and close them upon a hose, with means for forcing the clamp forward into the socket, and a device for holding the nipple.

Electrical.

VOLTAGE REGULATOR FOR DYNAMOS.—Malcom P. Ryder, New York City. This is a simple device which, in connection with a rheostat, operates automatically to maintain a constant voltage in the line, the arrangement being such that the rheostat may be operated by hand without interfering with the system. Combined with a regulator magnet and swinging armature is a circuit breaker actuated by the armature and comprising a slide plate on which is an insulated conducting block, while conducting springs secured to a stationary support are adapted to contact with the conducting plate. When the improvement is applied to the alternating system, the controller is connected to the station transformer and the current to operate the regulator magnets is taken from the exciter.

REGISTERING MECHANISM FOR LIGHT CIRCUITS.—William McNiell, Chicago, Ill., and James H. Tinder, Winchester, Ky. This is a positively acting mechanism for indicating the lamp hours to be charged to the consumer. Combined with a star wheel is a sliding swinging bar carrying pallets moving in right lines that are not parallel one with another, there being electro-magnetic mechanism for reciprocating the bar, and registering and carrying wheels and number disks.

CLOSED CONDUIT FOR RAILWAYS.—Charles D. Tisdale, Boston, Mass. According to this invention the main conductor is inserted in a tube of flexible material, upon which is placed an auxiliary sectional conductor provided with contact pins extending through the walls of the tube in position to be brought into contact with the main conductor when the auxiliary conductor and the tube are compressed by the trolley carried by the car. It is designed in this way to facilitate making local connections with the main conductor, and avoid the dangers attending the use of an exposed main line.

CAB SIGNAL FOR RAILWAYS.—Edgar C. Wiley, Bristol, Tenn. This is an improvement on a formerly patented invention of the same inventor, where an alarm bell on the locomotive has a local battery and circuit connections operated by induction through magnets along the roadbed. The present invention employs an ordinary make-and-break circuit bell, supplements the weakness of a relay operated by induction, and saves waste in the battery power for energizing the inducing magnets by a novel construction and arrangement of circuits, batteries, and their connection with the various mechanical parts.

Mining.

SETTLING TANK.—Daniel W. Fall, Frank B. Wineland, and Samuel L. Richards, Breckenridge, Col. This tank has partitions for classifying the slimes in the treatment of ores, and an agitating fan or wheel creating within the tank a regulated current, forcing the floating slimes to travel over all of the partitions and to one end of the tank. It also has a valve to control the discharge of sand and water, the force of which is used to drive the fan or wheel. A second tank receives the floating slimes beneath the surface of the water, a part sinking to the bottom, and the tank having an overflow chute so arranged that only a fluid will pass.

Mechanical.

WELL DRILL.—Charlie M. Lindholm, Rancho, Texas. This invention relates to deep well sinking apparatus, providing a drill arranged to automatically expand in the bottom of the well below the tubing, cutting a hole large enough for the tubing without requiring a second drilling or reaming. Two bit parts are arranged on opposite sides of and inclosing the shank, to which one of the parts is rigidly secured, while the other is pivoted to the shank, the cutting edges of the bits being flush with one another, and the rear end of the pivoted bit section having a bevel engaged by a spring secured to the shank.

TYPE FOUNDING MACHINE.—Auguste Foucher, 71 Boulevard Voltaire, Paris, France. This is a machine to cast two types simultaneously, having two models and two finishing mechanisms, the moulds and their sprue breaking, body dressing and finishing mechanisms being arranged in sequence, but echeloned in different vertical planes, while the corresponding moving parts are rigidly coupled together to be moved simultaneously in the same directions. All parts of the machine may be overlooked by the operator, and two finished types are made at each cast instead of one. The invention is an improvement upon an invention patented in 1887.

Miscellaneous.

ICE VELOCIPEDE.—Dan G. Bolton, Cooperstown, N. Y. The frame of this device is supported by single front and rear runners, to which it is connected by horizontal pivots, while a spiked propelling chain traveling along the under surface of the rear runner is driven from a pedal shaft by a spocket wheel mounted on the pivot connecting the runner with the frame. The runners are capable of sufficient rocking motion to permit passing over uneven ground, and the front runner is turned for steering purposes by a handle bar. The machine is designed to enable a rider to travel over snow and ice at a high rate of speed.

PRINTING ON GLASS, ETC.—Alfred Brookman, New York City. To give clean and distinct impressions of the designs without danger of breaking the articles printed upon, this inventor has devised an apparatus in which two beds having independent sliding movement may be separately actuated, a transfer pad being pivotally mounted on a slide arranged between the beds and adapted to be locked to either of them to slide therewith, while rollers journaled in stationary bearings contact with the transfer pad during the sliding movement. The rollers may, if desired, be employed for printing, in connection with the movable beds, without the pad, the rollers then having an air cushion, over which is canvas and a covering of printers' roller composition.

DECORATING GLASS, ETC.—James Budd, New York City. For the production of signs, letters, and ornamental designs on glass or enameled surfaces by acid or sand blast processes, this inventor has devised an improved method of producing and applying the necessary protective coating, which consists of an adhesive powdered and fibrous material. A roller covered with printers' roller composition is employed to apply the coating, the design on a block or plate being first inked with a varnish and picked up by the roller for transfer to the surface to be coated, and the coating thus transferred being dusted with the finishing covering to enable it to resist the acid or sand blast. The improved method is designed to give better results, and at a lower cost than the processes heretofore followed.

COAL SCREEN.—George W. Cross, Pittston, Pa. This screen is particularly adapted for picking or separating slate from the coal, and is made of series of segments or sections having longitudinal alternate troughs and ribs, the walls of the ribs converging at their upper edges and the troughs having in their bottoms slotted perforations. Both the troughs and the ribs diminish toward the lower end of the segments, meeting near the lower end a flat slotted surface from which is projected a slotted flange. Flat or slab coal will be likewise screened as well as the slate by this screen.

OPEN GRATE HEATER.—John Lawlor, Brooklyn, N. Y. This improvement may be used in connection with an ordinary open fireplace, and may also be readily employed as a portable heater. It provides for thoroughly ventilating a room, relieving it of heavy and impure air, insuring a uniform, perfect draught and complete combustion, without the use of a blower, while preventing the heat and smoke from escaping directly into the chimney flue. When used independently of an open fireplace, a heater casing is employed, adapted to rest on the floor or hearth, when convenient connection may be had with the smoke flue.

DOOR HANGER.—Theodore C. Prouty, St. Joseph, Mich. This invention relates more particularly to double track hangers for sliding doors, providing for such service a cheap and durable ball-bearing hanger, to be struck up from sheet metal. The hanger may be used in connection with the ordinary double-way wood tracks, and the carriage is adjustably connected to the door to receive a shaft centrally mounted on two rows of bearing balls, one on each side of its middle, the two ends of the shaft receiving the supporting wheels. The hanger is adjustably connected to the door to permit of properly placing the door vertically with relation to the supporting track.

WAGON BRAKE.—James W. Brubaker, Tracy, Iowa. The back pressure on the pole as the wagon descends a grade, according to the improvement patented by this inventor, operates to draw forward a connecting rod and forcibly set the brakes, but the wagon may be backed without setting the brakes on setting a simple form of brake latch. The brake bar is normally held set by a spring when the wagon is at a standstill, in opposition to which the draught devices act when the draught is on, and in conjunction therewith when the draught strain is off, so that the greater the back pressure, with a heavy load, the harder will the brake be applied.

HALTER.—Edward P. Waters, Roseville, Ill. This halter is very similar to the ordinary five-ring halter, but is inexpensively made, substantially of a single piece, doubled upon itself to form a nose band, extended in opposite directions through a ring and formed into chin pieces, doubled to form cheek pieces and its ends overlapped to form a crown piece, the ends being made fast to the chin pieces and the cheek pieces at their junctions, bit rings being held in the lower ends of the cheek pieces.

FIRE ALARM.—John P. Williams, South Pittsburg, Tenn. The alarm mechanism devised by this inventor comprises a main wire passed through the several rooms of a building and having a series of fusible joints, alarm bells being connected with the wire, which has weights or tension devices at each end. When the wires separate, the sections are drawn outward and the bells connected are operated. Supplemental portions are provided with loop sections and pivoted tripper devices to normally hold the bells from ringing, and, where the devices are used in a large building, one end of each of the wires preferably leads to an indicator in the office, to locate the floor on which the fire occurs.

HOTEL REGISTER.—David F. Riegle, Portland, Oregon. As an improved article of manufacture this register has its covers provided, beyond the leaves, with separable hinged extensions containing transparently covered advertising panels, the arrangement being such that when the book is filled and filed away the extension may be severed from it. Advertisements on the outer and inner faces of the extensions are prominently displayed, whether the book is closed or open.

TRUNK. — William S. Foster, Dallas, Wis. The shell of this trunk is cylindrical, and has rims, so that the closed trunk may be conveniently rolled about on the floor or ground. Mounted to turn in the shell is a cylindrical compartment box with partitions at right angles to each other, the partitions forming two sets of compartments, one set provided with lids and the other with straps. The shell is made in two hinged sections, and when these are opened one half of the com partment box is disclosed. By turning this box on its trunnions all of the compartments are successively brought to the top, as required, for packing or removing goods.

BAG.—William H. Field, Port Chester, N. Y. A strong and very cheap bag is made by this inventor, for carrying coal, etc., by forming the bag with a double bottom and relatively light sides, flat handles on the sides at the top connecting with the double bottom in such way that the bag will withstand the strain and may be easily carried.

DISPENSING LIQUORS, ETC. — James Tomlinson, Granby, Canada. This is an apparatus for registering the amount sold, and consists of reservoirs in a case, each having a discharge pipe terminating in a faucet provided with a filter, induction pipes being graduated to show the level of the liquor in the reservoir. Tell-tale tubes connected with the faucets are curved at their upper ends and provided with cups for receiving any liquor that may be forced out of the pipes. The invention covers three forms of register, one for the drachm or glass only, one for wine measure only, and one combining both the drachm and wine measure scales.

BOTTLING MACHINE.—August Werner, Brooklyn, N. Y. Connected with the storage cask are a liquid supply pipe and a gas supply pipe, while a bottle-filling valve of especial construction is connected with the bottle, the liquid supply pipe, and the gas supply pipe, in such manner that on first opening the valve the plug the gas passes into the bottle to drive out the air, and on further opening the valve the air escape is cut off and the bottle filled with the liquid, the gas in the bottle receding to the storage cask. The machine is comparatively simple and fills beer and other liquids into sterilized bottles without waste, and so that the beer will retain its valuable properties without danger of spoiling.

ICE SHAVER AND PICK.—William M. Seaman, Goldman Landing, La. This shaver comprises a casing having a slotted bottom, a cutter projecting an adjusted distance through the slot, and a hinged cover having on its pivot end an extension within the casing, to push the accumulated ice forward on opening the lid. The casing forms a handle for a pick of the ordinary kind, which is removably secured to the casing by a wing nut.

ICE CREAM FREEZER. — Edward L. Weston, Washington, D. C. Two or more kinds of cream can be frozen at once in this freezer, with no greater labor than that of freezing one kind in an ordinary freezer. Independent freezers or cylinders are located in a single tube, surrounded by the necessary ice, and the handle shafts are journaled in a shaft frame, the shafts being geared and a detachable coupling employed by which the sections may be locked together or freed to move independently.

GARMENT FITTING PATTERN.—Simon Christiansen, New York City. Two patents have been granted this inventor under this title, both showing improvements upon a former patented invention of the same inventor. One patent provides a plate of flexible material, with angular edge, the plate having a border incision to form a flexible edge strip connected at one end only, tabs connected to the strip to be adjusted toward and from the plate, while other tabs are also adjustably secured to the plate and carry a flexible marginal strip. According to the other patent the pattern plate has an edge with angular outline, and pivotally secured to its outer edge is a series of independent articulated links extending outwardly, each consisting of a plurality of pivotally connected members, a flexible strip being connected with the outer ends of the outer members, whereby any portion of the strip may be moved toward or from the plate. The improvement is designed to facilitate taking correct measures, and enable the operator to at once cut the material from the pattern.

SLEEVE PATTERN.—This is a further patent of the same inventor for an improvement facilitating the taking of the proper measure of the arm and the convenient cutting of the material into upper and under sleeve parts. The pattern comprises a series of sections in sets of two pivotally connected by links, and also pivotally connected with each other, a rod engaging the several pivotal connections, while a second rod held on one of the pattern sections has a sliding connection with the first rod. No especial skill is required in using the pattern to obtain simultaneously the proper shape of both the upper and under sleeve parts.

UNDER COAT SLEEVE HOLDER. — James Hoffman, New York City. This is a device for holding a coat sleeve close to the cuff while an overcoat is being put on, preventing the sleeve of the under coat from slipping upward. It consists of a curved body plate having one end upturned to form a hook, an elastic with double loops being fastened to the plate. The device is quickly applied and may be folded to occupy but little space in the pocket.

ANIMAL TRAP.—John Ross, Halifax, Canada. This is practically a double trap, and has provision for holding animals at each end. It has doors on its upper side near the ends, and downwardly inclined gates beneath the doors, in connection with tubular end sections in which are sliding pistons to forcibly eject animals through the doors. There are trap doors in the top, upon which tilting platforms mounted on the top of the box deliver, a bait rod sustaining bait near the platforms.

ANIMAL TRAP. — Charles A. Snow, Lime Springs, Iowa. This trap when sprung actuates a knife which kills the animal, the trap afterward resetting itself. It is made with a cylindrical case, cut away in front and slotted to allow for the swing or revolution of a knife, spring actuated, but held normally stationary by a trigger, below which is a tilting platform adapted to be depressed by the weight of the animal. On the depression of the platform the trigger is disengaged and the knife swings around, the trigger being then again in position to engage its shank, while the knife kills the animal and sweeps him from the platform during its revolution.

GAME APPARATUS. — William A. Barnes, New York City. This is an apparatus for use in connection with billiard, pool, or bagatelle tables. The balls are set up on the table in substantially circular arrangement, and then inclosed by a ring of tissue paper or similar material and covered by a piece of cardboard, or other substance, that the numbers on the different balls may not be seen. With the impact of the cue ball the paper envelope is broken and the balls scattered over the table, and if any drop into a pocket, the player holding a similarly numbered small ball, of those previously distributed, wins the game.

DOLL. — Frederick B. Schultz, New York City. This is an improvement in jointed dolls previously patented by the same inventor, the present invention providing a doll in which the articulated members can be readily turned without danger of breaking or dislocating the jointed parts. The parts are joined by ball and socket joints, and an individual chain is used for each articulated member, each chain being provided with yielding devices to permit of exerting pulls on the parts of the members, and also permit of turning them.

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.

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.

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(6263) J. D. F. says : Please tell me how to color old gun barrels where the color has worn off. Want blue and brown. A. Bluing barrels.—The bluing of gun barrels is effected by heating evenly in a muffle until the desired blue color is raised, the barrel being first made clean and bright with emery cloth, leaving no marks of grease or dirt upon the metal when the bluing takes place, and then allow to cool in the air. It requires considerable experience to obtain an even clear blue. Browning guns.—The following recipe for browning is from the United States Ordnance Manual: Spirits of wine, 1½ ounce; tincture of iron, 1½ ounce; corrosive sublimate, 1½ ounce; sweet spirits of niter, 1½ ounce; blue vitriol, 1 ounce; nitric acid, ¾ ounce. Mix and dissolve in 1 quart of warm water and keep in a glass jar. Clean the barrel well with caustic soda water to remove grease or oil. Then clean the surface of all stains and marks by emery paper or cloth, so as to produce an even bright surface for the acid to act upon, and one without finger marks. Stop the bore and vent with wooden plugs. Then apply the mixture to every part with a sponge or rag, and expose to the air for twenty-four hours, when the loose rust should be rubbed off with a steel scratch brush. Use the mixture and the scratch brush twice, and more if necessary, and finally wash in boiling water, dry quickly, and wipe with linseed oil or varnish with shellac.

(6264) E. R. asks : 1. Upon our ranch we have a hydraulic ram which forces water for domestic purposes into a tank 30 feet high. The ram is fed from an artesian well and the water has a fall of 24 inches to it. Every six or seven months, the air chamber becomes so filled with water that it scarcely operates until the chamber is removed and water allowed to escape. When the chamber is in that condition, the valve in operating pounds very hard, as though it was striking something solid. What causes the chamber to fill with water ? A. The air in the air chamber is absorbed by the water under pressure, when the water having no air cushion and being non-elastic produces a sharp concussion of the valve as observed. The air chamber should have an air cock at the bottom to let out the water and allow air to draw in when the air in the chamber has been absorbed. 2. Can I make an earth battery in the following manner. First dig a deep trench in moist earth, then stand a copper plate 4×4 feet upright in one end of the trench, then a zinc plate, same size, a short distance from the copper, and so on, copper and zinc alternately, indefinitely; the space between the plates to be filled with moist earth ? Would the current become stronger if salt deposits were made between the sheets of metals? A. This will make an earth battery if you connect all your zincs together and all your copper plates together. No zinc and copper must touch. The battery will be very feeble, and will if used soon polarize. No reliable calculation of its power in watts can be given. Salt water poured on the surface would increase the power.

(6265) J. M. S. asks if there is any way of prolonging the life of a fish 20 or 24 hours in a small quantity of water sufficient to cover them in a bucket. If the matter consumed by them to retain life could be artificially supplied, and if so how? A. Fish may live for several days in a very small quantity of water if it is aerated sufficiently to keep up the supply of air drawn from the water by the fish. A small tube reaching to the bottom of the pail and air blown into the water by a bellows for a few minutes, every few hours is all that is necessary. A very little food only is required, so as not to contaminate the water by the dissolved food.

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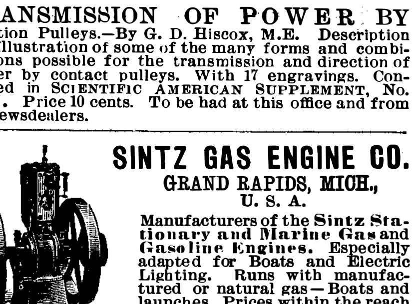

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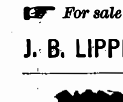

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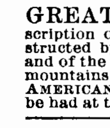

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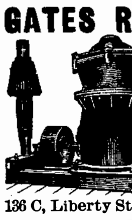

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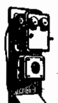

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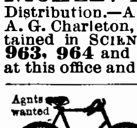

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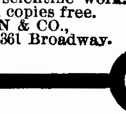

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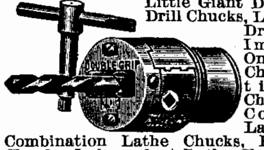

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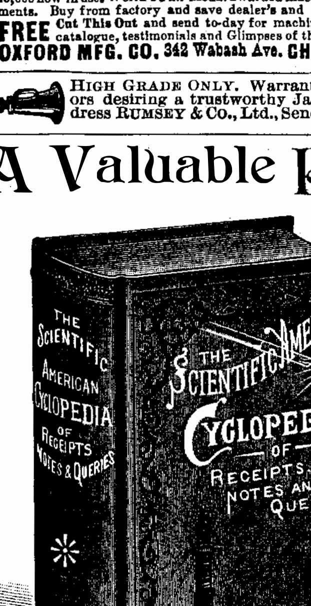

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