

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN.

A. E. BEACH.

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NEW YORK, SATURDAY, NOVEMBER 28, 1885.

Contents.

(Illustrated articles are marked with an asterisk.)

Bellows Falls water power.....	338	Inventions, miscellaneous.....	346
Boat, torpedo, novel.....	341	Mowers and reapers, cutting ap-	338
Boats, torpedo, progress of.....	342	paratus for.....	338
Books and publications, new.....	346	Notes and queries.....	347
Box, sample, improved.....	338	Panama route, is it practicable.....	336
Bridge, cantilever, over St. John	341	Photographic notes.....	337
River.....	339, 340, 341	Porpoise, milk of, chemical com-	341
Bronze, white.....	337	position of.....	341
Business and personal.....	346	Pyrophore, the.....	338
Clare, John, death of.....	341	Screw heads, wood.....	345
Color blind fireman.....	344	Shell fisheries of Connecticut.....	336
Cotton items.....	341	Sorghum, experiments with.....	345
Cover for chamber pipes.....	344	Sugar cane mills.....	336
Dry dock, Donald & Waddell's.....	343	Telephone litigation, progress of.....	336
Exposition, American.....	342	Telephone, Reis, original.....	335, 342
Great Eastern, sale of.....	344	Tidal theory and tidal predictions.....	344
Grinding machine, color, at the	343	Tongue, a still.....	343
Inventions Exhibition.....	343	Umbrella, magnetized.....	344
Horse with more sense than a	341	Unexpected, the.....	341
man.....	341	Vehicle, two wheeled, improved.....	338
Inventions, agricultural.....	346	Wash bottle for chemical labora-	344
Inventions, engineering.....	346	tories.....	344
Inventions, index of.....	347	Washing machine, Richardson's.....	338
Inventions, mechanical.....	346	Wool comb, improved.....	345

TABLE OF CONTENTS OF THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 517,

For the Week Ending November 28, 1885.

Price 10 cents. For sale by all newsdealers.

I. CHEMISTRY.—Loss of Camphor by Volatilization.....	8251
Development of Hydrocyanic Acid in Linseed Meal Infusions.....	8258
Hydrochlorate of Cocaine.—By Dr. SQUIBB.—The assay process.....	8259
Separation of Liquefied Atmospheric Air into Two Distinct	
Liquids.—By S. WROBLEWSKI.....	8259
Composition of Ocean Water.....	8260
Tablets of Compressed Pyrogallic Acid.....	8262
II. MINING, ENGINEERING, AND MECHANICS.—The Emery	
Mines of Asia Minor.—Report by Consul STEVENS.—The different	
mines.—Quality of the stone.—Costs.—Transportation.—Naxos	
emery.....	8248
Dust Burning Furnace.—2 figures.....	8250
Tubular Boilers.....	8250
Completion of the Canadian Pacific Railway.....	8250
Compound Locomotive, Webb's Patent, for the Campanhia Pau-	
lista.—With engraving.....	8251
The Cements of the Gate of France.—With full description of	
the works.—The quarries.—The aerial cable.—The furnaces and	
mills.—The products and their applications.—Quick-setting ce-	
ment.—Beton conduits for water, electric cables, etc.—19 figures.....	8256
A New Siphon Operated by Blowing.—1 figure.....	8258
Coze's System of Gas Retorts.—1 figure.....	8258
III. TECHNOLOGY.—Orthochromatic Photographs.....	8251
Lantern Slides by Contact Printing.—With several formulæ.....	8252
The Preservation of Timber.—Report of the Committee of Civil	
Engineers.—Selection of preserving process.—Conditions of suc-	
cess.—Will it pay?.....	8253
How to Recognize Good Wood.....	8254
Bleachworks Machinery.—6 figures.....	8254
Improved Hank Dyeing and Wringing Machine.—2 figures.....	8255
The Silk Industry in France.....	8255
IV. ELECTRICITY, HEAT, ETC.—A New Insulating Support for	
Experiments in Static Electricity.—1 figure.....	8260
Electrical Storage Batteries.—By C. H. HENDERSON.....	8260
Underground Temperatures.....	8261
V. HORTICULTURE, BOTANY, ETC.—Cultivation of Cinchona in	
Guatemala.—Report by U. S. Consul General WHITEHOUSE.....	8261
Plants for Margins of Lakes.—With engraving.....	8262
Planting: Preparation of the Soil.....	8262
VI. MISCELLANEOUS.—The British Elephant Battery, Burmah.—	
With full page of engravings.....	8247
Burmah.—Extent of the kingdom, government, etc.....	8248
The British War Operations in Burmah.—2 engravings.....	8248
The Vidal Language.—A letter.....	8248

PROGRESS OF THE TELEPHONE LITIGATION.

The first attempt to secure the co-operation of the government in an effort to break down the Bell telephone monopoly having failed by reason of technical irregularity in the proceedings, the Bell adversaries have joined hands for a new effort. The first step in the new departure is to obtain the approval of the Patent Office, which is called upon to say whether there are any facts which show the Bell patent to have been improperly granted, or any reason to suppose that the patentee's claims have a wrongful foundation.

A hearing was lately accorded to all the parties by the Secretary of the Interior, and many affidavits of experts and many long winded arguments were presented for his consideration.

After the hearing, time was allowed for putting in the lawyers' briefs. No decision by the Secretary has yet been made, but it may soon be expected. We have not space to traverse all the evidence; it is sufficient to say that the opponents of the Bell monopoly presented a very strong case, and the Secretary would appear to have good ground to report in favor of a United States trial.

A most interesting portion of the evidence was that contained in Prof. Elisha Gray's affidavit, in which he shows that Bell's success in the electrical transmitting of speech was due to the knowledge he obtained from Gray's caveat, the contents of which were wrongfully made known to Bell by the Patent Office examiner. Gray states substantially that he filed his caveat for a telephone Feb. 14, 1876, the same day that Bell filed his application for a patent for an improvement in "multiple telegraphy," and it is this patent of Bell that has been twisted by the lawyers so it now covers all creation. Prof. Gray says:

In a few days after the issuance of that patent, Bell made an instrument with which he transmitted speech. Long afterward he learned that Bell first transmitted articulate speech through a liquid transmitter, substantially as described in his (Gray's) caveat, and unlike anything described in Bell's application. For a long time he believed that Bell actually invented that instrument independently of his (Gray's) device. He now believes that Prof. Bell, on the contrary, had learned in some way of his caveat and its contents, and that he made use of that knowledge in constructing the instrument with which he first successfully transmitted articulate speech. He (Gray) had supposed that his discovery remained a secret in the Patent Office, as it should have done, and was not known to Mr. Bell. What he now states on the subject is in view of information which satisfied him that Mr. Bell, having obtained his secrets, claimed his discovery as his own, and by this means got the credit of his (Gray's) invention.

IS THE PANAMA ROUTE PRACTICABLE?

The climate and the necessity for a great dam at Gamboa still present serious obstacles to the construction of the Panama interocean canal. The Panama Star and Herald is reported as saying: "The successful completion of the canal is considered a mere question of time and money." This seems to be a carefully accurate statement. As for time—we can wait; but it may be doubted if the most patient capitalist, let him wait as long as he will, could get any return for his money, if any such sum is expended as that which it is now estimated a possible canal at this point would cost. The simple statement, "a dam at Gamboa must be built," conveys but an imperfect idea to the casual reader of what is really required. There are different kinds of dams. We have the mill-dam, an obstruction of wood and stone, for the storage of hydraulic energy and the giving of power by increased head; the dam for rendering the river above it navigable by increased depth; the irrigation dam for flooding lands; the coffer dam for raising sunken ships and building bridges; and the tinker's dam, a ridge of putty for stopping the run of molten lead. But the dam required at Gamboa is none of these. It must be large enough and strong enough to stop and hold the mountain torrents and floods while yet on their way down the sides of the declivities. In other words, these torrents must be held suspended above the proposed canal, and safely conducted to other parts. Else they are so fierce and powerful that they would quickly fill up the canal.

It is estimated that, in order to fulfill the requirements, this dam should be of solid masonry; about five miles long, thirty feet high, and fifteen feet broad. The extent of the waters it must hold in check may be estimated from the fact that, in the rainy season, the mountain torrents have been known to flood the valley of the Chagres for many miles to a depth of about sixteen feet.

So far the French company have done little more than scratch a new highway across the Isthmus, and yet almost the entire sum estimated for the completion of the canal has been expended. Only one-thirtieth of the dredging and one-fiftieth of the rock cutting has been done. M. De Lesseps, who is a diplomat rather than an engineer, is now trying to raise another \$120,000,000, believing, as he says, that this is all that

will be required to finish the canal. Expert engineers, on the other hand, say that \$430,000,000 will have to be added to the \$120,000,000 originally subscribed, to insure its completion; making \$550,000,000 in all.

Via Panama is certainly a tempting route. Look at the map, and you will see that at no place along the narrow strip of land separating North from South America, 1,200 miles in extent, is the distance from ocean to ocean so short as at Panama.

But the map, like the reconnoissance made by Lieut. Lucien N. B. Wyse, of the French Navy, and described to the Canal Congress that met in Paris, May 15, 1879, fails to picture the engineering difficulties and the climate. When these and the estimated cost of a possible canal at this point are considered, the good judgment of the American engineers in condemning it must be clearly apparent.

These men favor Nicaragua as the most practicable route for a canal, but the ship railway scheme of Mr. Eads, by way of Tehuantepec, has gained many friends, and in truth has much to commend it. This scheme, which has been fully illustrated in the SCIENTIFIC AMERICAN, provides for the transportation of ships across the Isthmus by rail; and while those who have not looked into the details might perhaps be inclined to regard it as visionary, it really demands no other mechanical processes than are already in daily use in the shipyard and the drydock. Its originator successfully carried out a scheme for the improvement of the mouths of the Mississippi, notwithstanding the opposition of a large portion of the engineering fraternity, who were inclined to view it as visionary and impracticable.

SUGAR CANE MILLS.

An unusually large plant for crushing sugar cane has lately been constructed at the iron works of Messrs. Deeley & Co., New York. It is expected to be at work crushing the cane on one of the Cuban plantations before the year ends. The three large crushing rolls, 34 inches in diameter and 6½ feet long, are made of cast iron, about six inches in thickness, and weigh, with shaft and gear wheel, nine tons each. Two are placed alongside of each other, and but a short distance apart, while the third is mounted above and between the other two. All these rolls are grooved circumferentially.

A steel knife, supported between the two lower rolls by a wrought iron beam, has one edge almost touching the grooved face of one of the rolls. It is then curved toward the other roll, and serves to guide the bagasse, or extracted cane, through the second opening, while the juice falls into the pan below the rolls. The construction of this knife is a special feature of the Deeley machines, and, it is claimed, prevents any interruption of the work by the jamming of the bagasse between the rolls.

Engines of one hundred horse power are required to drive the rolls. The motion is quite slow, being about 18 feet circumferentially per minute. An inclined platform leads down to the opening between the upper and lower rolls, and is provided with a continuous feeding device which delivers a layer of fresh cane two feet thick. As this opening is only one-eighth of an inch, and the older cane has a toughness almost equal to young pine wood, it will readily be seen that enormously heavy machinery is required to pass the bagasse through so small an opening, and extract the juices with any degree of thoroughness.

As much as 400 tons pressure is exerted between the upper and lower rolls. The king bolts used to lock the machinery together are made of wrought iron, six inches in diameter. Such a plant will treat 50 tons of cane in 10 hours. After treatment, the sirup is conveyed to the evaporators, and the bagasse is submitted to two or three days' drying in the open air, or is taken directly to the furnaces to be consumed as fuel.

The low price of sugar, and the competition from the beet root, have forced upon the manufacturers of cane sugar the necessity of the closest economy, of which these large and carefully built plants are an essential element. The industry is also becoming of commercial importance among the resources of Mexico, and similar but smaller plants for that republic are now under construction at the same works.

SHELL FISHERIES OF CONNECTICUT.

Since the year 1881, much time and labor have been given to the important work of mapping the oyster grounds within the jurisdiction of the State. There are now 772 lots of various sizes and dimensions; and in order to survey them properly, twenty-seven main signal posts were erected, besides many minor ones, and the commissioners' line was run from headland to headland, leaving the bays and estuaries inside that line to the jurisdiction of the several towns lying along the southern shore. The natural beds were then explored, surveyed, and mapped. Maps were finally prepared, known as "occupation maps," making use of a careful system of triangulation, by means of which every oyster lot in the portion of Long Island Sound belonging to Connecticut can be accurately described. The work in this respect is not yet done,

having been interrupted frequently by conflicting claims; but it has made rapid progress during the past year, and it is hoped that the commission may lay their finished map before the public before very long. Meanwhile the "occupation maps" answer nearly every practical purpose.

The entire number of applications for oyster lots filed since June, 1881, is 604; and the whole number of acres granted to the applicants has been, thus far, 45,668 acres, to which should be added the 33,988 acres previously designated by town committees, making the aggregate acreage of submarine farm-lands 79,656 acres, of which 16,202 acres are under actual cultivation. There is also a large area of good ground not yet designated. A considerable portion of what has already been taken up is held for speculation, but the cultivated area is steadily increasing, and might do so with greater rapidity were it not for the present law withholding oyster grounds from non-residents. The price is fixed at \$1.10 an acre, which of course is merely nominal, and intended to cover the costs. The State has actually received only a little more than \$50,000 from what has thus far been sold. But the taxes, concerning which there has hitherto been such dispute, are now paid without complaint, and this year amount to \$7,890, paid by 423 tax payers, of whom 93 own 10 acres apiece, or less than that, 33 own from 11 to 25 acres apiece, 152 own from 26 to 100 acres each, and 145 own each from 105 acres upward, some of the farms being of large size, including from 5,000 to 15,000 acres each. There are ten per cent more oyster growers than there were a year ago; and the fleet of oyster steamers has increased from forty last year to forty-nine this year. The depth of water overlying the oyster grounds varies from ten feet to seventy feet, and much of it could not be cultivated, were it not for the aid of steam power.

WHITE BRONZE.

In our issue of November 14, in the opening paragraph describing this industry it was stated as having been developed during the past two years. We should have said ten years. The industry has now been in successful operation for a decade, and is rapidly growing.

The Canadian Pacific Railway.

The recent completion of the Canadian Pacific Railway, after fourteen years' hard work, marks another chapter in the remarkable engineering history for which America has become famous. Surveys for the road began in 1870, and a vast amount of information respecting the transcontinental route was collected. These were not completed until 1878, when ten million dollars had been expended. The route thus laid out was considerably north of the present line, and opened up a larger area of prairie country. With the accession of Sir John MacDonal to power, the shorter route, crossing the mountains at Kicking Horse Pass, was decided upon. The road was at first a government undertaking, and by the end of 1880 there had been constructed 432 miles of track between Winnipeg and Lake Superior, 213 miles up the Frazer River in British Columbia, and some other smaller portions. The management however, did not prove entirely satisfactory, and in 1881 the enterprise was placed in the hands of the present corporation, which received the magnificent donative of 710 miles of completed road and attached property, \$25,000,000 in cash, 25,000,000 acres of land, exemption from taxation and customs on the materials for construction, besides other privileges, and gave in return a pledge to construct, equip, and operate a transcontinental line north of Lake Superior within ten years. A marked jealousy of American capital and fear of American control was manifested in the very beginning of the enterprise, and it was stipulated in the first charter that for six years shares could only be transferred with the consent of the government. Under the new corporation, however, a large amount of the work was done by American contractors, and Mr. W. C. Van Horne, a resident of Milwaukee, was made their general manager. The crossing of the Selkirk range, the second of the mountain barriers, considered the most remarkable engineering work on the line, was accomplished by an American, Major Rogers.

Under this new impetus, the work progressed with unprecedented rapidity. Forty thousand men at one time were employed along the line, and half that number were almost continuously at work. For days together, the average advance would amount to three and three-quarter miles, and between Winnipeg and the Rocky Mountains an average of over two and a half miles was maintained. Old lines were purchased and incorporated into the system. A new line was constructed between Montreal and Toronto, and the communication between Winnipeg and the sea completed by the establishment of a line of steamers on the Great Lakes. On other parts of the line, the work was progressing scarcely less rapidly. In British Columbia, Chinese laborers were pushing eastward, and in Ontario, the wild country on the northern shore of Lake Superior was being pene-

trated by dint of hard and persistent labor. In May last, the different sections east of the mountains were connected, and a continuous track extended from Quebec to the foot-hills of the Rockies—a grand stretch of twenty-five hundred miles. But a gigantic undertaking in itself still remained before the two oceans were again connected. Three distinct mountain ranges had still to be crossed—the Rocky Mountains proper, the Selkirk range, and the Gold Range. Between the Rockies and the Selkirk the great Columbia River had to be spanned, and again between the Selkirk and Gold range, when its volume was greatly augmented. But all these difficulties and barriers were finally surmounted, and on the 6th of November the last connection was made at the Sushwap Lakes, on the Pacific division. A completed track of 3,100 miles, or about one-eighth of the circumference of the globe, stretches from Quebec to Fort Moody, while 1,500 miles of tributary track adds power to the system.

The road has cost a quarter of a billion of dollars. In 1884, the government made a loan of twenty-two millions of dollars, and the last Parliament advanced eleven millions more, taking land at two dollars an acre in payment. For some years a large revenue will be derived from the sale of land and town sites, but the road cannot probably pay expenses for a long time to come. It penetrates a country which is not only uninhabited for hundreds of miles, but which was absolutely unknown until invaded by the engineer and his gangs of laborers. It must create its own business by building up communities along the line, and opening up the unoccupied prairies to shepherd and farmer. In Ottawa the road passes through a country whose chief commodity is the picturesque, but further west the Red River country gives promise of large industries and permanent development. Already the metropolis of this new interior, Winnipeg, contains 30,000 people, and emulates the growth of St. Paul and Minneapolis. In the mountains the arrival of the railroad will bring new life to the mining industries, and the farmers will find a constantly growing market for their products. It is possible that the route may serve England as a means of communication with her Indian empire. The admission of British Columbia into the Canadian Union has already given it a political importance.

PHOTOGRAPHIC NOTES.

Large Exhibition of Photographs.—Over seven hundred miscellaneous photographs of a great variety of subjects formed the first annual exhibition of the Society of Amateur Photographers of this city, held on the 17th and 18th inst. at the Sloane Building, Broadway and 32d Street; such a large number demonstrating very forcibly the popular interest taken in photography by those who pursue it as an amusement, and as a help in art studies.

Upon the walls were hung beautiful specimens of artistic photographs, comprising landscapes, composition subjects, and marine views. Many excellent instantaneous photographs were noticeable for their perfectness in detail and the excellent skill which must have been used by the maker in the development of the negatives.

Photographs of buildings, animals in various attitudes, portraits, natural objects, such as flowers, microphotographs, of lightning, of steamer life, enlargements from small pictures, interiors, studies in posing, steamers in motion, stereoscopic photographs, window transparencies, lantern slides, and marine architecture simply indicated the wonderful scope and variety of subjects which were covered and the advance which has been made in recent years.

There were twenty-three classes, divided as follows: Landscapes without figures, landscapes with figures, marine (surf), marine (including vessels), architecture, interiors, portraits (not taken under skylight), groups (not taken under skylight), cloud effect, flowers, animals, still life, street views, composition subjects such as expectation and halt, rustic bridge, enlargements, stereoscopic transparencies, lantern slides, photomicrographs, platinotype, and an entire collection.

Diplomas were awarded in each class, and many of the pictures thus favored were noticeable more for their artistic points than any special technical skill. A view of group of children under some trees, entitled "Listening to the Birds," was extremely natural, the expression of the different faces being very apropos to the subject. A composition subject called "Halt!" was of a young lady perched on a bicycle, held upright by the usual bicycle frame, partly concealed in the grass.

A collection of twenty views of architecture, cloud effects, steamers and sailing vessels in motion, street views, and landscapes, all made by a member only eighteen years of age, were remarkably well done, attracting, as they deserved to, considerable attention.

A series of historical views, showing the old arm chairs used by General Grant, the interior of the room in which he died, and the accompanying simple decorations and accessories about the same, the road over which he took his last ride, the spot where he stopped,

and the view he obtained looking off from the mountain, were especially interesting as making a complete photographic record of his last days.

Some photographs of Egyptian boats scenes, and old olive trees lent variety to the exhibit, and were finely executed.

The lantern slides were exhibited by the Society's lantern in the evening, and formed an interesting part of the exhibition. The opening night was largely attended by many ladies and gentlemen, and the general sentiment expressed was one of surprise that so many artistic pictures could be shown.

The first exhibition was therefore acknowledged to be quite successful and meritorious; it will doubtless lead to others of still greater merit and usefulness, all of which will tend to elevate the standard of amateur photography.

Toning Baths.—Mr. Frederick A. Jackson, who displayed specimens of fine printing at the N. Y. Amateur Society's exhibition, gives us the following as his method of toning: The solution should be kept one day before use, and before being immersed, the prints should be washed for twenty minutes in five changes of water.

ACETATE BATH.

Chloride of gold.....	3 grs.
Acetate of soda.....	70 grs.
Bicarbonate soda.....	12 grs.
Water.....	16 oz.

To obtain the best results it is necessary that the bath be decidedly alkaline; and to insure good working it is advised to have at hand (especially if it is a new bath) a bottle containing a saturated solution of bicarbonate of soda. Taking a single print, immerse it in the bath, and note how it works—it is likely to be slow; if unsatisfactory, add three drops of the soda solution, then three more, and so on until it is observed that the toning commences, which should cease in ten or fifteen minutes. If a longer time is required, it would indicate that the bath was not sufficiently alkaline.

Having determined by experiment the proper condition of the bath, successive prints—a few at a time—are toned in batches with certainty of success.

The bath will keep and can be used repeatedly, it only being necessary to strengthen with chloride of gold as it becomes weakened.

In toning, it is necessary to carry it along until the prints acquire a rich purple tint, and this must not be judged by their appearance in the solution, but only when viewed by transmitted light. A properly toned print should show the purple tint, rich and warm, clear through the paper.

After toning, the prints should be washed for ten minutes in three or four changes of water, and then fixed in a hypo solution—one to twelve—with a little ammonia added, for twenty minutes.

For brilliant black and white, brown, and purple tones, the following bath is preferred:

CHLORIDE OF LIME TONING BATH.

Place in a graduate:

Chloride of gold.....	2 grs.
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And add:

Precipitated chalk.....	20 grs.
Saturated solution chloride of lime.....	2 drops.
Boiling water.....	16 oz.

It may be used as soon as cool, but better results are obtained after 10 to 24 hours. In 48 hours its activity is greatly lessened.

The prints are washed in two waters, and removed from the third direct to the toning bath.

Brown Tone.—Keep the print in the bath until it assumes by transmitted light a crimson lake color. Two trials may be necessary before the exact tint can be obtained; when it has been reached, the print should be placed in clear water and rinsed thoroughly.

Purple to Black.—Continue the toning until by transmitted light the print presents a decidedly purple color—the finer, lighter portions will then attain a delicate lilac.

Should this tint appear before the shadows assume the darker purple, the print is toned, and should be carried no further.

The shorter the prints are kept in clear water before toning, the better, as with the lime bath they do not bleach much; it is therefore not necessary to print so deep as to thicken the shadows.

If the paper is taken from the printing frame too soon, and is underprinted, clear and cold prints will be obtained resembling an engraving, by adding to the above bath:

Bichloride of platina, 1/2 a grain, made neutral with carbonate of soda—for each grain of gold.

The prints thus toned will not be in the least affected or reduced by the fixing bath.

At the London Inventions Exhibition, gold medals were awarded to the Mason & Hamlin Organ and Piano Co. and to Messrs. Steinway & Sons, for the general excellence of their instrument, and for several inventions of merit. A silver medal was given to Mr. George Gemunder for musical instruments of the violin class and for the best imitations of the old masters; and a bronze medal to the Smith American Organ Company.