SCIENTIFIC AMERICAN

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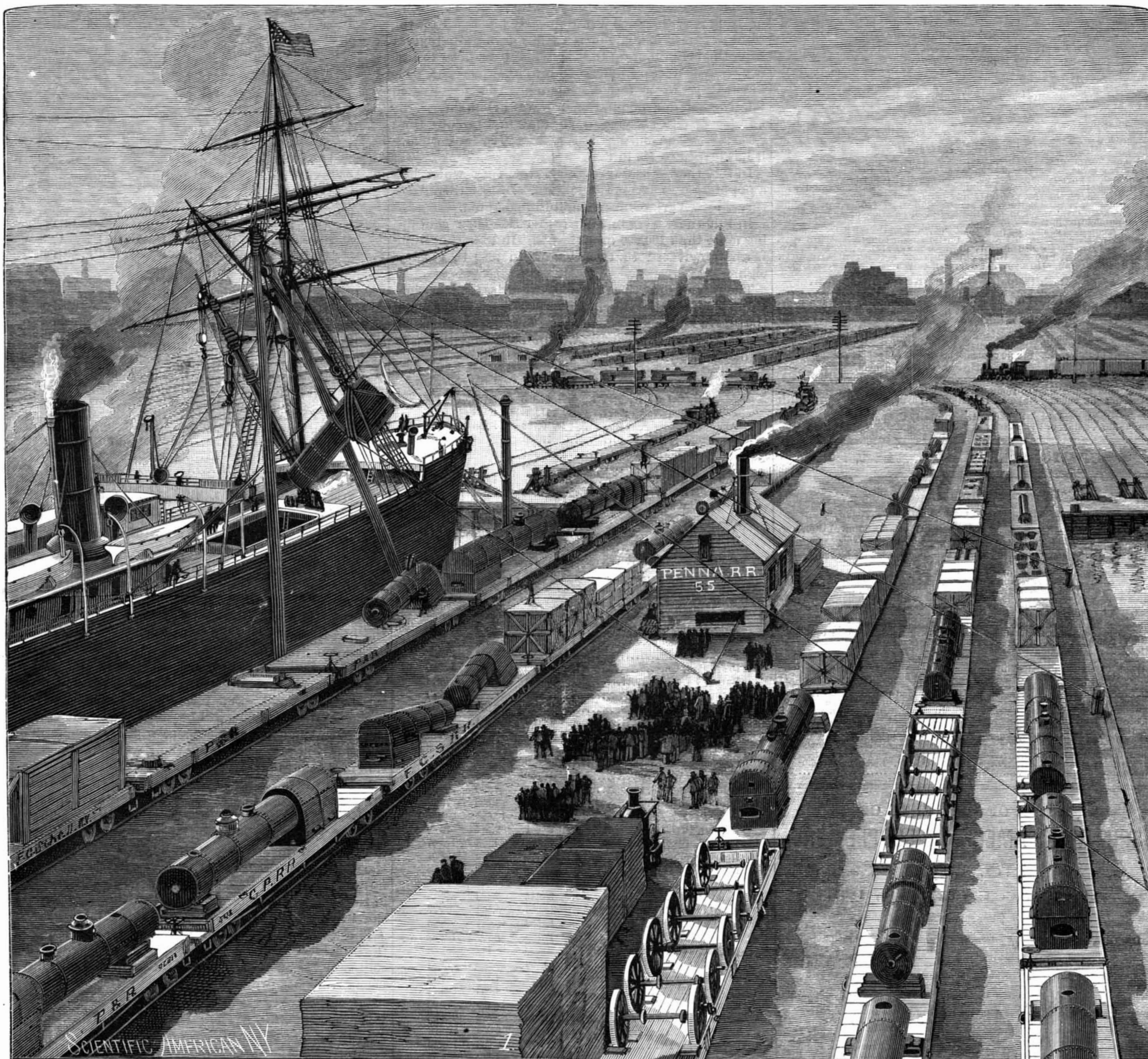

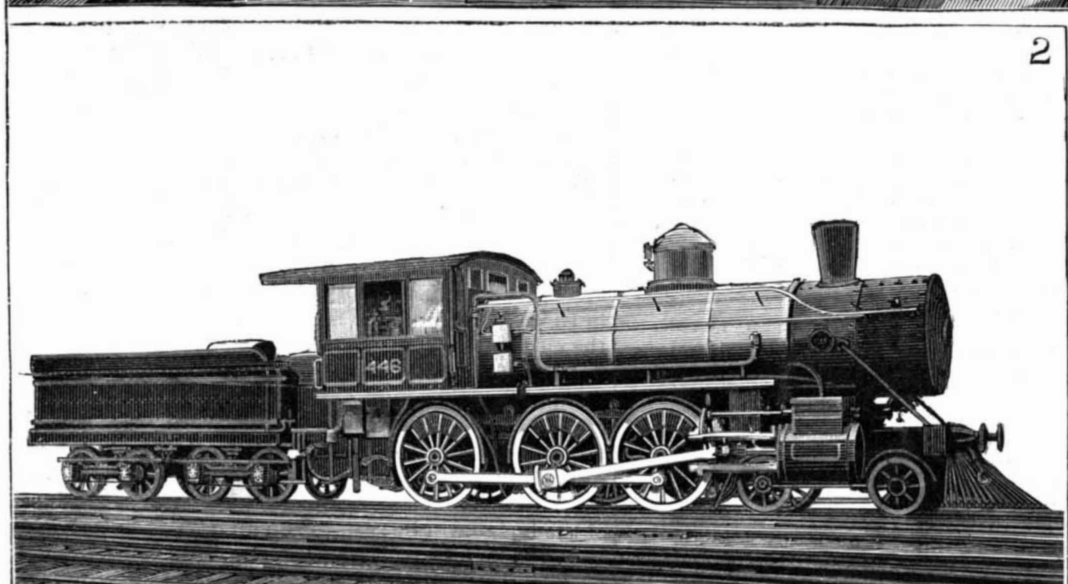

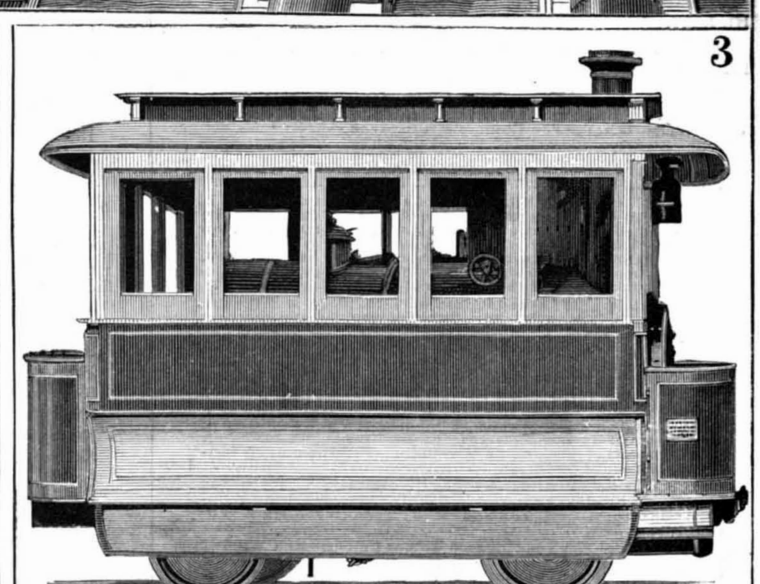

1. Loading the locomotives on the steamer Henley. 2. Type of ten-wheel passenger locomotive. 3. Light tramway locomotive for street service.

SHIPMENT OF AMERICAN LOCOMOTIVES TO AUSTRALIA.—[See page 293.]

Scientific American.

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NEW YORK, SATURDAY, MAY 9, 1891.

Contents.

(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 801.

For the Week Ending May 9, 1891.

Price 10 cents. For sale by all newsdealers.

OUR URBAN POPULATION.

Mr. Robert P. Porter, Superintendent of the Census, has lately issued a bulletin relating to urban population, prepared under the direction of Mr. William C. Hunt.

In the published records of former censuses, urban population has been defined as that element living in cities, or other closely aggregated bodies of population, containing 8,000 inhabitants or more. This definition of the urban element, although a somewhat arbitrary one, is used in the present discussion of the results of the Eleventh Census in order that they may be compared directly with those of earlier censuses. The proportion of urban population has increased gradually during the past century from 3·35 up to 29·12 per cent, or from one-thirtieth up to nearly one-third of the total population. The increase has been quite regular from the beginning up to 1880, while from 1880 to 1890 it has made a leap from 22·57 up to 29·12 per cent, thus illustrating in a forcible manner the accelerated tendency of our population toward urban life. The number of cities having a population of more than 8,000 increased from six in 1790 to 286 in 1880, whence it has leaped to 443 in 1890.

In 1880 there was but one city, New York, which had a population in excess of a million. In 1890 there were three, New York, Chicago, and Philadelphia.

In 1870 there were but fourteen cities each containing more than 100,000 inhabitants. In 1880 this number had increased to twenty, and in 1890 to twenty-eight.

The rate of growth of some of the cities is surprising. From the 443 cities having over 8,000, we select those that have increased by more than 75 per cent, and they number more than 100. It will be seen that Spokane Falls "takes the cake."

	1890.	1880.	Increase per cent.
Alameda, Cal	11,165	5,708	95·60
Alpena, Mich	11,283	6,153	83·37
Amesbury, Mass	9,798	3,355	192·04
Amsterdam, N. Y	17,336	9,466	83·14
Anderson, Ind	10,741	4,126	160·32
Anniston, Ala	9,876	942	948·41
Arkansas City, Kans	8,347	1,012	724·80
Asheville, N. C	10,235	2,616	291·25
Ashland, Wis	9,956		
Ashtabula, Ohio	8,338	4,445	87·58
Atlanta, Ga	65,533	37,409	75·18
Atlantic City, N. J	13,055	5,477	138·36
Battle Creek, Mich	13,197	7,063	86·85
Bayonne, N. J	19,033	9,372	103·08
Beatrice, Neb	13,836	2,447	465·43
Beaver Falls, Pa	9,735	5,104	90·73
Binghamton, N. Y	35,005	17,317	102·14
Birmingham, Ala	26,178	3,086	748·28
Bridgeport, Conn	48,866	27,643	76·78
Brockton, Mass	27,294	13,608	100·57
Brunswick, Ga	8,459	2,891	192·60
Butler, Pa	8,734	3,163	176·13
Butte, Mont	10,723	3,363	218·85
Canton, Ohio	26,189	12,258	113·65
Cedar Rapids, Iowa	18,020	10,104	78·35
Chattanooga, Tenn	29,100	12,892	125·72
Chicago, Ill	1,099,850	503,185	118·58
Chippewa Falls, Wis	8,670	3,982	117·73
Cheyenne, Wyo	11,690	3,456	238·25
Colorado Springs, Colo	11,140	4,226	163·61
Corning, N. Y	8,550	4,802	78·05
Dallas, Tex	38,067	10,358	267·51
Decatur, Ill	16,841	9,547	76·40
Denison, Tex	10,958	3,975	175·67
Denver, Colo	106,713	35,629	199·51
Des Moines, Iowa	50.093	22.408	123·55
Detroit, Mich	205,876	116,340	76·96
Duluth, Minn	33,115	3,483	850·76
East Liverpool, Ohio	10,956	5,568	96·77
East Portland, Ore	10,532	2,934	258·96
Elgin, Ill	17,823	8,787	102·83
El Paso, Tex	10,338	736	1,304·62
Evansville, Ind	50,756	29,280	73·35
Everett, Mass	11,068	4,159	166·12
Findlay, Ohio	18,553	4,633	300·45
Fitchburg, Mass	22,037	12,429	77·30
Fort Scott, Kans	11,946	5,372	122·38
Fort Smith, Ark	11,311	3,099	264·99
Fort Worth, Tex	23,076	6,663	246·33
Fresno, Cal	10,818	1,112	872·84
Gloversville, N. Y.	13,864	7,133	94·36
Grand Rapids, Mich	60,278	32,016	88·27
Hastings, Neb	13,584	2,817	382·22
Hazelton, Pa	11,872	6,935	71·19
Helena, Mont	13,834	3,624	281·73
Hot Springs, Ark	8,086	3,554	127·52
Huntington, W. Va	10,108	3,174	218·46
Hutchinson, Kans	8,682	1,540	463·77
Iron Mountain, Mich	8,599	....	....
Ishpeming, Mich	11,197	6,039	85·41
Jackson, Tenn	10,039	5,377	86·70
Jacksonville, Fla	17,201	7,650	124·85
Johnstown, Pa	21,805	8,380	160·20
Joliet, Ill	23,264	11,657	99·57
Kansas City, Kans	38,316	3,200	1,097·38
Kansas City, Mo.	132,716	55,785	137·91
Kearney, Neb	8,074	1,782	353·09
Key West, Fla	18,080	9,890	82·81
Knoxville, Tenn	22,535	9,693	132·49
Kokomo, Ind	8,261	4,042	104·38
La Crosse, Wis	25,090	14,505	72·97
Laredo, Tex	11,319	3,521	221·47
Lima, Ohio	15,987	7,567	111·27
Lincoln, Neb	55,154	13,003	324·16
Little Rock, Ark	25,874	13,138	96·94
Long Island City, N. Y	30,506	17,129	78·10
Los Angeles, Cal	50.395	11,183	350·64
McKeesport, Pa	20,741	8,212	152·57
Macon, Ga	22,746	12,749	78·41
Malden, Mass	23,031	12,017	91·65
Manistee, Mich.	12,812	6,930	84·88
Marinette, Wis	11,523	2,750	319·02
Marion, Ind	8,769	3,182	175·58
Marion, Ohio	8,327	3,899	113·57
Marquette, Mich	9 093	4,690	93·88
Melrose, Mass	8,519	4,560	86·82
Memphis, Tenn	64,495	33,592	92·00
Menominee, Mich	10,630	3,288	223·30
Meridian, Miss	10,624	4,008	165·07
Milwaukee, Wis	204,468	115,587	76·90
Minneapolis, Minn	164,738	46,887	251·35
Mount Carmel, Pa	8,251	2,378	247·10
Mount Vernon, N. Y	10,677	4,586	132·82
Muncie, Ind	11,345	5,219	117·38
Muskegon, Mich	22,702	11,262	101·58
Nanticoke, Pa	10,044	3,884	158·60
Nashville, Tenn	76,168	43,350	75·70
Nebraska City, Neb	11,494	4,183	174·78
Ogden, Utah	14,889	6,069	145·33
Omaha, Neb	140,452	30,518	360·23
Paris, Texas	8,254	3,980	107·39
Passaic, N. J	13,028	6,532	99·45
Perth Amboy, N. J	9,512	4,808	97·84
Pine Bluff, Ark	9,952	3,203	210·71
Plattsmouth, Neb	8,392	4,175	101·01
Portland, Ore	46,385	17,577	163·90
Pottstown, Pa	13,285	5,305	150·42
Pueblo, Colo	24,558	3,217	663·38
Rockford, Ill	23,584	13,129	79·63
St. Paul, Minn	133,156	41,473	221·07
Salt Lake City, Utah	44,843	20,768	115·92
San Antonio, Tex	37,673	20,550	83·32
San Diego, Cal	16,159	2,637	512·78
Seattle, Wash	42,837	3,533	1,112·48
Shamokin, Pa	14,403	8,184	75·99
Sheboygan, Wis	16,359	7,314	123·67
Sioux City, Iowa	37,806	7,366	413·25
Sioux Falls, South Dakota	10,177	2,164	370·29
South Bethlehem, Pa	10,302	4,925	109·18
Spokane Falls, Wash	19,922	350	5,592·00
Springfield, Mo	21,850	6,522	235·02
Steelton, Pa	9,250	2,447	278·01
Streator, Ill	11,414	5,157	121·33
Tacoma, Wash	36,006	1,098	3,179·23
Topeka, Kans	31,007	15,452	100·67
Trenton, N. J	57,458	29,910	92·10
Union, N. J	10,643	5,849	81·96
Waco, Texas	14,445	7,295	98·01
Wausau, Wis	9,253	4,277	116·34
West Bay City, Mich	12,981	6,397	102·92
Wichita, Kans	23,853	4,911	385·71
Winona, Minn	18,208	10,208	78·37
Winston, N. C	8,018	2,854	180·94
Youngstown, Ohio	33,220	15,435	115·23

EXPERIMENTS FOR THE ARTIFICIAL PRODUCTION OF RAIN.

Among the government appropriations is $9,000 to be expended in making experiments on the artificial production of rain. We learn that the first experiment will be made in Western Kansas next June under the direction of Col. Dyrenfurth, of Washington.

Balloons filled with hydrogen and oxygen gas will be sent up and exploded by a steel wire attached to the balloons and connected with an electrical apparatus on the ground. Senator Farwell favors this idea because the concussion will be greater, and the greater the concussion, the more copious will be the fall. The balloons will also be aided in their work by the explosion of dynamite on the ground.

Drought is the curse of the Western farmer. In the State of Kansas, the western part especially, the eastern part of Colorado, the Southwest Territories, Texas, the two Dakotas, Nebraska, Minnesota, and, indeed, in nearly all the country west of the Mississippi River the dry seasons are frequent and dangerous to the welfare of the crops. The removal of this great bugbear of the farmer would be a boon that is beyond expression in words.

Those who are interested in the matter will find in the SCIENTIFIC AMERICAN of December 20, 1890, accounts of various examples of rain supposed to have been artificially produced.

PHOTO-ENGRAVINGS FOR NEWSPAPERS.

At the recent annual meeting of the Camera Club, London, Mr. H. Sutton read a paper about a new method of producing photo-blocks for newspaper work. He said the process was the result of the labor of years. He had been working at the problem since 1881, and only on the previous Monday had he obtained results sufficiently advanced to be worth bringing before the Camera Club. He had effected the direct conversion of photographs into blocks without intermediate conversion into fatty ink or bitumen images, followed by skilled etching to get type-high blocks. A process of this kind ought to give great impetus to the graphic arts. He simply electrotyped a relief image produced in the gelatine bromide film of an ordinary negative; the electrotype is then at once passed on to the printer. A gelatine bromide negative is developed with alkaline pyrogallol or quinol, then fixed in strong hyposulphite of soda, and washed with care, so that it shall not absorb too much water. If it be now placed horizontally on a metal plate, and gradually heated to 212° Fah. by the flame of a Bunsen's burner, the shadows of the image will be seen to run all over the plate. If, however, before development the negative had also been impressed under a crossed-line screen, so that the line screen and the picture would develop together, each little dot of the screen image would hold a certain amount of reduced silver, bearing some definite proportion to the action of light and development, and be surrounded by a fine line containing no silver where the opacity of the screen had prevented action. The reduced silver produces a certain amount of insolubility of the gelatine with which it is in contact, and the adjacent soluble gelatine, when heated as already described, runs beneath the insoluble gelatine by capillary action, thus producing dots and an image in relief. This capillary action is proportional in some way to the amount of reduced silver, and during the heating the two effects of relief and graduation are produced at the same time. The electrotype is taken direct from the glass negative in relief.

A New Departure in Jet Propulsion.

To the Editor of the Scientific American:

I have been an experimenter with water jet propulsion for the past few years, and the conclusion I have ultimately arrived at is that the jet is sure to drive screw and paddle wheel out of the market.

It has been the general opinion that the loss from the jet was caused by friction in the pipes. This may be true to a certain extent with outlets of such small dimensions as Dr. Walter M. Jackson has adopted, and who, in my opinion, has gone to extremes both as regards size of jet and velocity of discharge.

I have discovered that the real loss in all jet propellers has been that, as the direction of the jet has been always in a straight line in an opposite direction to the vessel's way, the jet cannot find a fulcrum close to the discharge to act against except the peripheral part of said jet. Such a jet, as the vessel is moving onward, will always discharge its water against water having already acquired a great velocity in the same direction, and will meet with very little resistance, and the greater the velocity of such a jet, the greater will be the slip.

I have been in Europe for the past four years, and have come in contact with almost all the eminent engineers and naval architects, and have closely followed the trials of the jet lifeboat Duke of Northumberland.

A little over a year ago the idea suddenly occurred to me to use two or more jets, the nozzles pointing in an opposite direction to the vessel's way, and to make such jets revolve around a common axis in circular paths like the tips of a screw propeller. The object was not to allow the jet time to give the velocity to the water acted upon, and so to find a solid fulcrum for the entire area of the jet close to the discharge.

I gradually perfected my apparatus and made some trials, which not only proved the theory entirely correct, but also showed that this mode of propulsion was far more efficient, more economical, and safer than any other known mode.

I am well aware of the fact that in order to bring it to that state of perfection necessary to give it a commercial value, many a trial will have to be made yet, but I am fully satisfied that the invention will do what I claim for it.

Any existing screw vessel can be altered without any alteration to the hull whatever, no matter whether single or twin screw vessel.

My invention is fully protected; this, however, is the first communication I have made to a scientific paper.

Yours, very respectfully,

ALEXANDER VOGELSANG.

Brooklyn, New York, April 25, 1891.

THE SCREW PROPELLER.

The screw propeller, so called from the configuration of its blade surfaces, does really not exercise the functions of a screw, but is an immersed waterwheel with angular floats or vanes of varying obliquity.

The slip of the screw propeller should not be calculated from the pitch of its blade angles, but from the mean velocity of rotation. The velocity of rotation is the real velocity imparted to the water in an opposite direction to the vessel's way. A screw, however, when in rotation and moving onward, constantly acts upon new bodies of water, and the suddenness with which the accelerated water comes in contact with undisturbed water will not permit it to maintain the imparted velocity any great distance.

Blades of great width at the periphery will keep up the acceleration of water for a longer period than narrow ones, hence the latter being more efficient. The pitches of the blades should be such that they can easily follow up the speed imparted by the velocity of rotation; if made too fine, the speed of the vessel will become greater than the pitch, and what has heretofore been termed "negative slip" will be the result. The speed of the vessel will also be materially reduced, as the backs of the blades press against the water toward which they are advancing. The pitch also regulates the quantity of water acted upon, as well as the direction of the water imparted; but it is wrong to say that a coarse pitch accelerates the water more than a fine pitch. Rather the contrary might often be the case.

The value of an increasing pitch blade is not to be found in the gradual acceleration of the water, but in the gradual increase of the volume of water acted upon. Such parts of the blade surface where the rotary speed is less than the speed of the vessel will have no propulsive effect whatever. When a screw is set in rotation with the vessel moored to the wharf or dock, every particle of blade surface will come into full action, and the engines will not be able to attain the same number of revolutions as with the vessel in motion. The less the resistance from currents, head winds, and sea a vessel encounters, the smaller the effective propelling blade area becomes, and the less will be the power required for a given number of revolutions.

ALEXANDER VOGELSANG.

Natural Gas in Kentucky.

BY H. C. HOVEY.

In Meade County, Kentucky, near the town of Brandenburg, and located about 25 miles southwest of the city of Louisville, is a limited area of subterranean gas, differing remarkably from all other known fields. Extra-limital borings prove the area to be only about seven miles long and five miles wide. Geologically it is unique. While the Ohio and Indiana gas belt is wholly in the Trenton formation, that of Kentucky lies in the black Devonian shales, from which coal oil was distilled before the discovery of oil wells. The shales are overlaid by heavy limestones. There are three terraces between the Kentucky hills and the Ohio River. The lower terrace begins at the top of the Keokuk subcarboniferous limestone, where the depth of gas wells is 400 feet. On the upper terrace they cut through 156 feet of the Saint Louis limestone. The dip is from northeast to southwest, and about 20 feet to the mile. The depth of the wells varies accordingly. The shale is peculiarly compact, and almost as solid as cannel coal, being slatelike in appearance. It is highly fossiliferous, being full of the remains of algæ and marine shells, among which were noticed in great abundance the *Leptæna sericea* and the *Discina nitida*.

About thirty years ago parties bored here for oil; but obtaining merely gas and salt water, they closed the wells. Five years later Mr. Moorman opened one of these wells and operated it for the manufacture of salt; and the flow of both gas and water continues to this day in undiminished quantity. Other wells in the region have also been worked successfully for salt—a matter not now treated. The fact is that the entire shale is heavily charged with gas; but the trouble, in many places, is in a poor delivery. The gas seems to be available only where the texture of the shale is more openly stratified at the joints, thus allowing an escape. Although the rock is everywhere highly bituminous, no free oil is found except in very small quantities, barely enough to give the water an oily odor, and occasionally to tinge its surface with prismatic colors from the thin oily films.

As already remarked, the gas and salt water come out together, and the problem has been to separate them. The method by which this is accomplished is original and well worth describing. A 2 inch tube is run down in a working barrel, joined to a perforated anchor let into a pocket from 60 to 80 feet below the gas vein. This perforated tubing rests on the bottom. The water is pumped up through the central tube by means of suction rods, while the gas is delivered with unimpaired pressure between the tubing and the casing of the well. Six wells are grouped to an engine, centrally located as to the set operated, and connected with all of them by jointed surface rods, making a "spider." It takes only 25 pounds of steam pressure to keep the pumps going, unless a well happens to be "drowned," when more pressure must be put on temporarily. The engine in use is only 12 h. p., with a 15 h. p. boiler.

Thus far forty wells have been drilled in by different companies. It is found safe to drill wells within 300 feet of each other. The largest well put out in 24 hours 2,000,000 feet of gas. Three wells drilled within 600 feet did not interfere in the least with the flow of this first one. The original rock pressure is 94 pounds, and the working pressure about 45 pounds. The gas is brought to Louisville by an 8 inch line of pipes, and, as I was informed by Major Wm. J. Davis (connected with the State survey, and who has kindly verified my statements in this communication), the flow is characterized by extraordinary persistency; in this respect resembling the gas of Fredonia, N. Y. The company, as Major Davis tells me, are now supplying 700 customers in private residences, and are actually selling a million and a half cubic feet daily; being the product of eight wells averaging daily at the wells about 350,000 cubic feet, and piped 35 miles. Every well is said to be equally productive. By using air compressors the supply delivered in Louisville is increased about 50 per cent; and when the number of 8 inch mains is increased to four, as is contemplated, the sales will daily reach about 12,000,000 cubic feet.

The Kentucky Rock Gas Company now controls this gas territory, and has the exclusive rights for supplying Louisville, where it sells the gas delivered at 25 cents per thousand, both for fuel and illumination.

THE cost of a high-class eight-wheel passenger locomotive is about $8,500.

Practicability of the Flying Machine.

The annual meeting of the National Academy of Sciences began at Washington on the 21st of April in the National Museum. A number of interesting scientific papers were read. That of Professor S. P. Langley, of the Smithsonian Institution, on "Flying Machines," attracted the greatest attetion. Professor Langley gave the results of a series of experiments he began about five years ago to ascertain the possibilities of aerial navigation. He said that he set up on the grounds of the Allegheny Observatory a whirling machine with a diameter of sixty feet, and driven by a steam engine of ten or twelve horse power. He first sought to ascertain whether or not it required more power to move laterally than to stand still in the air. For this purpose he had suspended a flat brass plate from the arm of the whirling machine by a spring. When the machine was put in motion and the plate encountered an artificial wind going forty miles an hour, the spring instead of elongating actually shortened, showing that the weight or power required to suspend the plate was less when in motion than when it was standing still. His next series of experiments, Professor Langley said, demonstrated that it took a second or two more for a brass plane to fall four feet while in motion than when it was dropped from the hand without motion, the plane when in motion laterally sinking slowly as if the air had become dense like cream. From his experiments he reached the conclusion that the amount of power required for artificial flight was perfectly attainable by steam engines we now possess. To him the amazing thing demonstrated by the experiments was that the faster you go the less it costs in power, and that a one-horse power will transmit a much heavier weight at a rapid speed than at a slow one.

In summing up Professor Langley said that he did not say that man could traverse the air, but under certain conditions and with our existing means, so far as the power is concerned, the thing was possible. The difficulties would be in getting started, in coming down to the ground again, and in guiding one's self through the air. Nature had supplied an instructive intelligence in a bird to balance and guide itself. He did not question that man would ultimately acquire it. He thought all aerial navigation would pass out of the sphere of charlatanism and into the hands of engineers in a short time, possibly months instead of years. He believed we would see something notable come from it.

Other papers were read by A. S. Packard on "Further Studies on the Brain of Limulus Polyphemus;" by F. H. Bigelow on "The Solar Corona;" by Dr. Washington Matthews on "A Report on the Human Bones of the Hemingway Collection in the United States Army Medical Museum;" by A. A. Michelson on "Application of Interference Methods to Spectroscopic Measurements;" and by H. S. Pritchett on "The Corona from Photographs of the Eclipse of January 1, 1889."

The Watson gold medal, awarded for astronomical work, was conferred on Dr. Arthur Anwers, of Oberlin.

Making and Tempering Spiral Springs.

When the steel spiral spring of an instrument gets broken, it is much more satisfactory to make one than to send the instrument off, and be without it for a week or more.

To make them use the best spring steel wire; select a smooth iron rod the size of the spring to be made; carefully draw the temper from the wire; fasten the rod and one end of the wire in a bench vise. Now wind the wire evenly and closely around the rod, until you get the length of the wire required for the spring. Take the rod out of the vise; fasten one end of the spring to the rod; taking hold of the other end, draw it along the rod until the spirals are the correct distance apart. To give the amount of spring wanted, fasten it firmly to the rod, then make the spring and rod red hot, and quickly plunge them into cold water. After drying, rub them all over carefully with oil, and move them about in the flame of a lamp until the oil takes fire, which will give the spring the proper temper. I know there are some who make springs direct from tempered wire; but they are much more durable if shaped and *then* tempered.—*Dr. Wm. H. Steele, in Items of Interest.*

Photoelectricity.

Prof. G. M. Minchin, at a meeting of the Physical Society, January 16, read a paper on the electromotive force developed by light falling on sensitive plates which were immersed in suitable liquids. The blue end of the spectrum was found to be the most effective. Currents have a photographic effect on the plates, and this action is strictly confined to the parts through which the current has passed. Comparatively strong currents were obtained from plates coated with eosine and gelatine. A Hertz oscillator restored the sensitive state in a cell placed at a distance of 81 feet. An arrangement of 50 cells in series with an electrometer was exhibited, by means of which light falling on the cells could generate sufficient e. m. f. to ring a bell or light an electric lamp.—*Nature.*

A Contrast in Inventions.

That we are the most inventive people in the world, says the New York *Tribune*, is a well known fact. Indeed, the idea has peen put forward (in this country) that we are the most remarkable people on the face of theearth in all respects, and this is probably so, the very fact that other nations do not always recognize it being of itself sufficient to show their great inferiority. But it is not to the purpose to enlarge on this in the present instance, our aim being simply to describe a certain small but wonderful invention just reported from the State of Minnesota. It is interesting to note in passing the marked difference in the character of the inventions in Iowa and Minnesota. Lying close together as the two States do, we would expect, the writer adds, to find their inventive talent running in generally parallel lines, but such is not the case. The inventive genius of Iowa seems to be turned almost wholly to apparatus to circumvent the liquor prohibition law. Thus we have the Dissolving Liquor Store and the Flying Dutchman Saloon, already mentioned in the *Tribune's* columns, the walking stick which holds a pint, the pocket bible which holds a quart, the amateur camera which holds a quart and a half, the opera glass which holds two drinks, and the raised and glorified silk hat which holds two quarts, a pair of glasses, a silver spoon, a lemon, a quarter of a pound of sugar, and a dozen cloves. In Minnesota, where no prohibitory law exists, we find invention turned to the arts of peace, and scarcely a day passes that the household, the office, or the factory is not enriched by a new idea of some bright Minnesota man. We gather the particulars of the latest invention in that quarter from the columns of the *Republican*, an enterprising weekly published at Lake City.

The new article in question is the Ne Plus Ultra Rocking Chair, the invention of Mr. A. R. Watson, and is now on exhibition at Crane Brothers' mammoth jewelry store. Mr. Watson's idea is that the rocking chair should stand for comfort; but the ordinary rocking chair, though surpassing every other invention of man for its comfortable features, does not embody everything in that line. It has been Mr. Watson's pleasant privilege to supply some of these missing adjuncts. Chief of these is the temperature regulator. Underneath the chair is a small bellows. This is operated by the rocking of the chair, and is connected with a brass tube which extends up the back of the chair and slightly above it, where it curves down and ends directly over the occupant's head. When sitting in this chair and rocking, a gentle but invigorating breeze is diffused over the entire person from the tube. It is especially agreeable to bald-headed men, and an air shower bath of this nature must be very pleasant for any one on a warm day. But the ingenious Mr. Watson is determined that his chair shall have all seasons for its own, and next fall he will add an attachment under the bellows consisting of a kerosene or gas heater, which will so warm the current of air that the fortunate owner of one of these chairs will find it as useful in winter as in summer. A little scent bag concealed in the bellows perfumes the air delightfully, whether it is hot or cold. The air current in the summer will be found excellent for discouraging the attentions of flies and mosquitoes, and that the bald-headed man may take his afternoon nap in it undisturbed, Mr. Watson has concealed a spring and the necessary mechanism under the bellows, so that it may be wound up like a clock and run two hours, rocking the chair, and, of course, working the bellows. A music box in the back, which plays the national airs, completes the improvements to date, though so long as Mr. Watson is spared his mental faculties, no man can tell when others may follow.

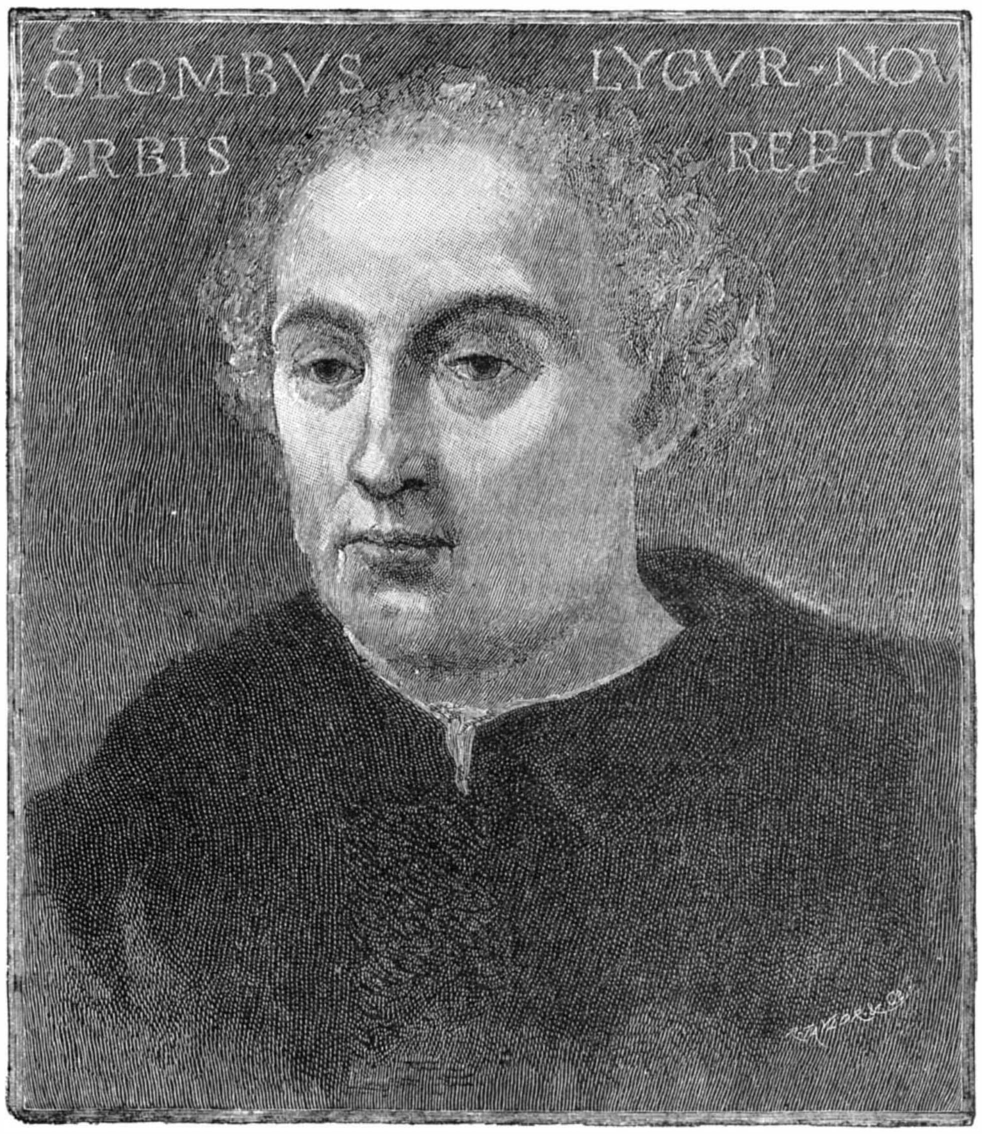
As we said, the contrast between the inventions of the two neighboring States of Iowa and Minnesota is truly striking. But how much more will those of Minnesota do for the cause of civilization? For instance, how much greater will be the influence for good of the Watson hot and cold air rocking chair than will be that of a hymn book which holds a quart—or even two quarts!

Copper Colorations of Vegetables.

At a meeting of the Paris Society of Pharmacy, December 3, 1890, a paper by M. Mestre was discussed, in which the author claimed that the copper colorations existing naturally or artificially in vegetables are perfectly harmless. He said that there was often less copper in colored conserves than in many unsuspected aliments, and the copper was found only in conditions of difficult solubility. In colored peas the average proportion of copper present was 7 cgm. to ½ kilogramme, but he had found as much as 21 cgm. The average quantity in beans was 56 mgm., the maximum quantity was 99 mgm. Bread, he stated, contains an average of 5 mgm. of copper per kilogramme, and wheat 5 to 10 mgm. Preparations of pork contained 51 mgm., and those of geese 35 cgm. Chocolate contained 36 mgm. The conclusions of the author were that people might use and abuse the privilege of employing colored vegetables without feeling toxic effects from the copper contained in them.

AN ORIGINAL PORTRAIT OF COLUMBUS.

The old portrait of Christopher Columbus recently discovered at Como derives its value not only from the scarcity of authentic likenesses of the great navigator, but from its art history, as it was painted by Sebastian del Piombo.* It was formerly regarded as an heirloom in the family, now extinct, of the Giovios, and was in the possession of the writer Paul Giovio, who refers to it in his works, and had it engraved. On the failure of the male branch of the Giovio family, the portrait passed, two generations ago, to the De Orchi family, and is now in the possession of Dr. De Orchi, of Como.—*Illustrated London News.*



PORTRAIT OF COLUMBUS BY SEBASTIAN DEL PIOMBO RECENTLY DISCOVERED AT COMO.

* Sebastiano del Piombo was born in Venice in 1485, and died at Rome in 1547. He was especially celebrated as a portrait painter, his likeness of Andrew Doria, in the Doria Palace, at Rome, being one of his best known works. He also acquired fame as a painter of the portraits of the Colonnas and of Popes Adrian V., Clement VII., and Paul III.

The Ship Railways of the Future.

In a paper lately read by John F. O'Rourke on the Chignecto ship railway, before the American Society of Civil Engineers, the author said:

"This will be the first application of rails to navigation, and Canada has secured the honor by guaranteeing for twenty years an annual sum equal to one two-thousandth the yearly receipts of the New York Custom House. As when built it will, most likely, be self-supporting, Canada may be said to have purchased the honor with a little accommodation.

"If ship railways will do all that is claimed for them, and it is morally certain that they will, a new era is about to open in transportation. A ship is not a fish, though that seems almost asserted in the stress that is laid on the popular statement that water is its natural element, and usage makes it difficult to think of a ship apart from water. It is lost sight of that a ship is a land-built structure of the strongest and stiffest design, fitted to withstand the tossing and buffeting of the highest seas and the wildest storms. Now pounded and overswept by a colliding wave, and the next moment bare of water almost to the keel, while all the time, perhaps, the rocking and plunging and the mighty wind is tearing the rigging and snapping the spars. Nevertheless, vessels that have lived through fifty years of such life are not uncommon.

"Lighthouses and breakwaters tell enough of the fury of the sea to ridicule any pretense of hydrostatic pressures around ships excepting in still water, or that naval constructors build ships dependent on the water pressure to keep the cargo from bursting out the sides, or that water is the natural element of ships in the caressing sense used by the good people who object to ship railways as snares of destruction.

"It therefore follows that a ship resting on blocks at short intervals, along the keel and bilges, is adequately supported, and that if borne on a suitable carriage over a smooth and rigid roadway, it will make the journey with as much ease as under the most favorable conditions afloat, or, generally speaking, that a ship is as well adapted to traveling by rail as by water.

"The Chignecto ship railway will soon be an accomplished fact. Others will quickly follow, and it takes no gift of prophecy to foresee the time when every isthmus will pass ships dry shod, if need be, and when inland cities will be open to navigation with rails, and the freight car and the ship will occupy adjoining sidings at the warehouse and factory. It is not beyond belief that a twentieth century siege may be conducted by war vessels on temporary roads, opposed by traveling fortresses on strategic railways that defend every approach."

Hydraulic Electric Lighting.

The Hartford, Conn., Electric Light Company has nearly completed a notable undertaking for utilizing the fine water power of the Farmington River, wherewith to operate their central station, from which is distributed current for both light and power throughout the city of Hartford.

Under contract with the Farmington River Power Company, which owns the dam, about 300 feet long, across the Farmington River, nearly ten miles from the city, the Electric Light Company has erected a station with a full equipment of dynamos, etc., and will hereafter furnish the current for all the city street lights and for power purposes from that station.

Six dynamos are now in operation, supplying 250 street lights. Four more are to be added, which will then generate enough electricity to supply the rest of the street lights, two hundred of which are yet supplied from dynamos operated by steam in the station on State Street. It is intended to add a large generator of 300 horse power for supplying electricity for power purposes.

The fall over the dam is 19½ feet, and the volume of water about two feet deep. The force is estimated to be equal to 1,000 h. p. The supply of water is considered to be unfailing, and far in excess of any possible future requirements of the lighting company. To convert this great power from the river, six Rodney Hunt horizontal water wheels are used, with a capacity of 800 h. p., and the power is conveyed to the dynamos by shafting and belts.

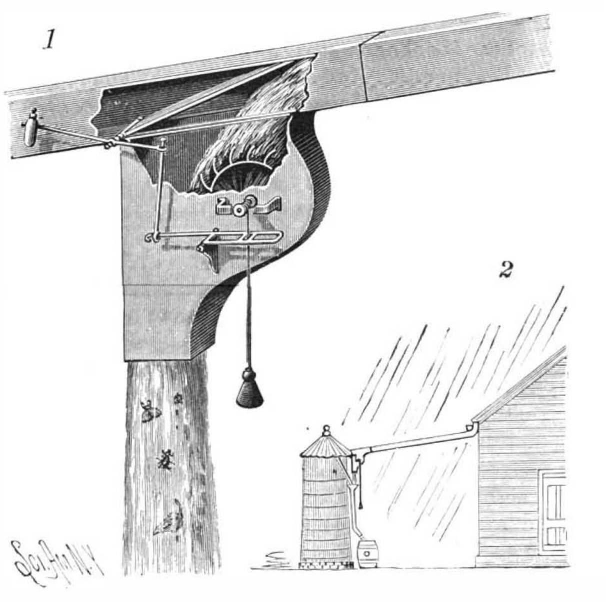
To convey the electric current to the city, 500 poles, varying from 40 to 70 feet high, have been erected, carrying eleven wires. The water power at the dam is very steady, and improvement in the city lights supplied from this source is already perceptible.

Parasitical Plants.

The author proves that a parasite growing on plants of the *Strychnos* genus contains neither strychnine nor brucine. The mistletoe growing upon the oak does not contain the blue tannin of the latter, but exclusively a green tannin. In like manner other parasites are shown not to absorb the peculiar principles of their hosts.—*A. Chatin.*

AN IMPROVED RAINWATER CUT-OFF.

The device shown in the illustration, which has been patented by Marion N. Coe, of New Orleans, La., is designed to prevent the flow of water from sheds or roofs into the tanks or cisterns until a sufficient quantity of rain has fallen to wash away the dust and dirt from the roof. This cut-off acts automatically, and also serves to prevent the passage of birds, rats, and insects into the cistern. Fig. 1 is a broken side elevation of the device with the parts in position, and Fig. 2 shows another application where the overflow pipe serves as a waste pipe. In the bottom of a conductor of the usual description is an opening, in the lower end of which a gate is fixed upon a transverse rod, the gate fitting so that the water flows readily over it when the gate is closed. On the outer end of the rod on which the gate is pivoted is a lever weighted at one end to normally raise the gate, the opposite end of the lever having an eye, through which extends a vertical rod connected with a frame pivoted on a bracket connected with the conductor. Fixed to the side of an enlarged portion of the spout beneath the conductor is a frame through which extend drum-carrying shafts, one shaft having a pinion meshing with a gear on the other shaft to transmit a slower motion thereto, and the latter shaft having a rope attached to its drum, the rope extending downwardly through the frame and having a weight attached at its lower end. Fixed to the other shaft is a waterwheel arranged beneath the opening in the conductor. With the device in its normal condition, as shown in Fig. 1, the water falling upon a roof first flows through the opening in the conductor upon the waterwheel, and by turning the latter winds the rope upon the connected drum shaft until the weight reaches the frame, the raising of the free end of which actuates the rod connected with the lever adapted to close the gate in the conductor. The water flowing through the conductor then holds the gate closed,



COE'S RAINWATER CUT-OFF.

while, the water being shut off from the wheel, the weight falls, unwinding the rope from the drum, and leaving the gate so that it rises when the flow of water through the conductor ceases. The length of time it is desired to allow the water to run to waste may be regulated by the length of rope with its weight operating the frame, while, to close the gate quickly, the rope may be attached directly to the drum of the shaft carrying the waterwheel.

For further information relative to this invention address M. N. Coe & Co., P. O. box No. 257, New Orleans, La.

A New Method for Retaining Artificial Dentures.

One of the great discomforts of artificial dentures, where all the teeth have been lost and much absorption of the gums has taken place, is the constant tendency for them to slip forward. To overcome this difficulty Mr. William Dall, of Glasgow, has developed a method of fixing dentures by means of two or more gold pins attached to the under surface, which enter holes either made by drilling the jawbone or left after the extraction of a tooth. In the former case the gum is first painted with a fifty per cent solution of cocaine, and the holes are drilled by means of the dental engine. In the lower jaw any place may be chosen between the symphysis and the mental foramen, and in the upper, almost anywhere, care, however, being taken not to pierce the floor of the antrum. Koch's solution is used as an antiseptic at the time of operation and also prescribed as a mouth wash during healing. The denture is applied a few days later, and is of course to be regularly removed for the purpose of cleaning. He believes that the bone forming the walls of the socket becomes sclerosed, and that there is little danger of necrosis. Where the holes or sockets result from the extraction of teeth, the gold pins have simply to be fixed to the denture, and in all cases it is important that they should be parallel.

During the last three years Mr. Dall has drilled ten cases in all, seven in the upper and three in the lower jaw, and in only one inflammation followed by suppuration occurred, and this quickly subsided. In fifteen cases dentures were inserted with pins entering the sockets of extracted teeth. Two cases were shown at the Odonto-Chirurgical Society of Scotland exemplifying this method of treatment. This operation can hardly be considered analogous to wiring bones together, as was suggested during the discussion of Mr. Dall's paper, for this is done under antiseptic conditions impossible in the mouth, and, moreover, every effort is made to keep the wound aseptic afterward, whereas in drilling the sockets are left open. Some objections to the operations are the risk of opening the antrum or the inferior dental canal and the difficulty of keeping the sockets clean.—*Lancet.*

To Color Brass Work.

A beautiful violet color is imparted to brass work by the application of chloride of antimony, says a writer in *Work.* Get the work perfectly bright and clean by the usual methods, either in a lathe or by dipping, etc.; heat it over gas-flame or spirit-lamp, so that water will steam off it but not fizz, and then apply the chloride of antimony liquor with a piece of rag or pad attached to a piece of wood; when the metal has assumed an even color, polish by rubbing with a soft cloth perfectly clean and dry, and protect with a coat of clear lacquer. Should you prefer a darker color, use either of the following recipes: (1) To one part oxide of iron, or iron filings, add one part arsenic and 12 parts hydrochloric acid. Dissolve the oxide of iron or filings in the acid, then add the arsenic, strain and bottle for use. (2) One pint of strong vinegar, one ounce of salammoniac, one-fourth ounce arsenic, one-half ounce alum; dissolve in the vinegar and bottle. These mixtures are to be applied in the same way as chloride of antimony, and, as you are doubtless aware, the ultimate shades may be varied by treating with various lacquers. In all cases the work should be polished with a dry cloth immediately the desired color is obtained, and in the case of the two latter recipes the work should be lacquered at once; but with the chloride of antimony this is not essential. With regard to Florentine bronze the only recipe I know of is the following: The work having been finished bright and clean is covered with a coating of copper. Now make a paste with Spanish brown 12 parts, and black lead 1 part, in hot water. Dissolve a small quantity of oxalic acid—say as much as will fit on a sixpence—to one-half a pound of other ingredients, also in hot water, and thoroughly mix the whole; thin with hot water to a workable consistence and apply with a soft brush. When dry, polish with a medium brush. This done, the work is ready for lacquering, a pale lacquer being employed.

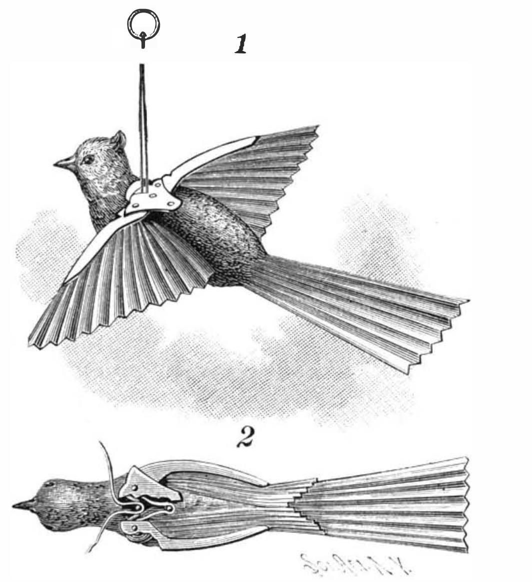
Telephoning in French.

The London and Paris telephone seems to be destined to have a far less or, at any rate, a considerably less usefulness than was at first expected of it, for a very peculiar reason. The telephone can indeed transmit sound, but it cannot enable a person who understands written French to understand spoken French, especially through a telephone. Something, some undefined, intangible difficulty, was speedily discovered by persons using the telephone for the first time, and who at first laid their inability to hear to the telephone, but the sound was well defined, and in understanding the mother tongue there is no difficulty. It is only when Englishmen accustomed to correspond or telegraph in French attempt to speak or hear it that the difficulty—one well known to every visitor to foreign lands—comes into play.

Until, therefore, our teaching of French is reformed, which we hope will be soon, or until intending users take lessons in pronunciation, they will evidently have to content themselves with telegraphing as before, or with having an interpreter at the other end who can understand. After all the trouble to obtain an absolute sound-proof chamber for isolating the stock exchange men, what a curious result it would be to be forced to employ an intermediary simply because the telephone will not talk the French of Stratford-atte-Bowe!—*Electrical Engineer.*

A TOY BIRD FOR CHILDREN.

The device shown in the engraving is designed to closely resemble a bird suspended by an elastic cord, and which may be made to appear to fly. It has been patented by Mr. Abraham Pugsley, of Jamestown, R. I. Fig. 1 shows the bird with its wings spread, and Fig. 2 is a broken top view with the wings closed. Each wing consists of a front plate or strip and a flexible connection secured thereto and to the body of the bird, the flexible portion being usually made of cloth, and crimped or crinkled to resemble feathers. The plate is curved inwardly toward its inner end, and a cut-off diagonal portion is pressed upon by a spring to hold the wing closed. The plates are pivoted near their inner ends, and have notches from which extend grooves in which the suspending cord is held. The inner ends of the wings are covered by a plate, which also supports the wings and the spring which presses against them, and the pin around which the suspending cord is passed. The suspending cord is doubled in the center and secured to an elastic cord terminating in a finger loop or ring,

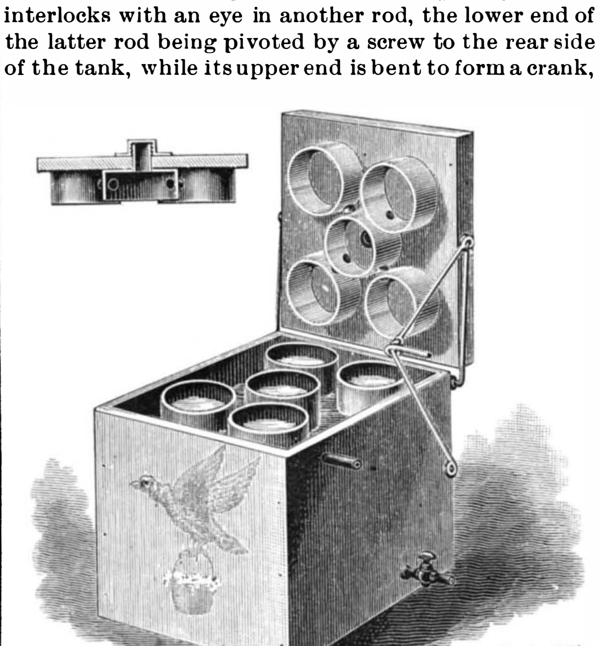


PUGSLEY'S TOY BIRD.

each member of the cord being passed through a notch of the cover plate and around a pin in opposite directions, the ends of the cord being secured in notches of the wing plates, the wings being opened to their full length by pulling upon the suspending cord. The bird is properly balanced by filling a hole in its body with lead or some heavy substance suitable for ballast. By taking hold of the finger loop and raising and lowering the hand, and giving it other movements, the bird may be made to sail through the air in very good imitation of the flight of a real bird.

A COOLER FOR HOLDING MILK CANS.

The illustration represents a convenient receptacle for holding milk cans for cooling their contents, at the same time providing for the escape of animal heat from the milk. The construction forms the subject of two patents granted to Mr. William W. Conder, of Tillamook, Oregon. The milk-holding vessels are preferably united at the bottom to form a common receptacle, held in the tank by hooks and staples, the milk being cooled by water being admitted through one pipe and flowing off by the other pipe. Upon the under side of the tank cover are depending flanges adapted to fit closely upon the milk cans or milk-receiving vessels, and serve as covers therefor, and each of these covers is connected by a branch pipe with a central pipe projecting upward through the cover, such central pipe being shown as communicating directly with the central cover. The central pipe is provided with a suitable screw-threaded cap, as shown in the small view, and when such cap is removed, the animal heat from the milk in the various receptacles passes off freely. The cover is hinged to the tank by means of a rod pivoted in suitable keepers, each end of the rod being bent to extend at the side of the cover, to which it is attached by eyes. On one side of the cover the rod is also formed into a depending arm having an eye which interlocks with an eye in another rod, the lower end of the latter rod being pivoted by a screw to the rear side of the tank, while its upper end is bent to form a crank,



CONDER'S MILK COOLER.

the whole forming a simple hinge and handle, by which the cover may be raised and lowered. With this construction the flowing water causes the milk to be cooled quickly and the cream to rise rapidly, it being designed that the water shall be admitted to the tank through the lower pipe to strike first against the bottom of the milk receptacle and flow out near its top.

Correspondence.

Cutting Glass Again.

To the Editor of the Scientific American:

The simplest way to cut a bottle by heat that I have found, is this: Take ordinary wrapping twine and put two strands around the bottle where cut is desired, tying a hard knot and cutting ends close. Then take kerosene oil sufficient to wet the strings well, apply a lighted match, rotate the bottle rapidly so as to keep heat in a narrow band; in a moment plunge into cold water, and the bottle cracks off smoothly.

I made a plunge battery of 26 cells in this way out of large mucilage bottles and did not spoil one of them.

H. A. DOBSON, M.D.

Washington, D. C., April 17, 1891.

How to Clean a Plaster Cast.

To the Editor of the Scientific American:

To the question asked, How to clean a plaster cast? I have never seen the following recipe given, which has been most highly recommended to me by an ingenious man who has spent his life so far in the working of plaster.

If a cast has not been painted, oiled, or waxed, and allowing it is a bust or statue that is to be cleansed, invert the figure, and from the bottom fill it with water, free from iron, and allow it to filter through the plaster. After the filtering process has gone on for a sufficient time, and the outside surface occasionally washed with water and a soft brush, it will be found, after the plaster has dried, that all of the dust has passed from the pores of the cast and it is again restored to a whiteness that cannot be gotten in any other way.

I have not had occasion to try the above recipe, but send it to you in full confidence that it will do what my informant claims. WILLIAM COUPER.

Studio Ball, Florence, Italy, April 9, 1891.

Mathematical Curiosities.

To the Editor of the Scientific American:

I send you a few of what might be called mathematical curiosities. To any of your readers who have not seen them I think they cannot but be interesting.

1. A finite quantity to the zero power is equal to unity. Take 6 as the finite quantity. Then $6^\circ = 1$, since $1 = \frac{6}{6} = \frac{6^1}{6^1} = 6^{1-1} = 6^0$.

2. The zero root of a finite quantity is equal to infinity. Take 6 again. Then $\sqrt[0]{6} = \infty$, since $\sqrt[0]{6} = 6^{\frac{1}{0}}$; but $\frac{1}{0} = \infty \therefore 6^{\frac{1}{0}} = 6^\infty = \infty$.

3. The infinity root of a finite quantity is equal to unity. Take 6. Then $\sqrt[\infty]{6} = 1$, since $\sqrt[\infty]{6} = 6^{\frac{1}{\infty}}$; but $\frac{1}{\infty} = 0 \therefore 6^{\frac{1}{\infty}} = 6^\circ = 1$.

4. Infinity multiplied by zero is equal to a finite quantity. Take 6. Then $\infty \,.\, 0 = 6$, since $0 = \frac{6}{\infty} \therefore$ $\infty \,.\, 0 = \infty \,.\, \frac{6}{\infty} = 6$.

GEO. D. GUYER,
Cadet U. S. M. A.

West Point, N. Y.

Aluminum at Boonton, N. J.

To the Editor of the Scientific American:

I have seen in your journal of April 4 the article credited to the Cleveland *Plain Dealer*, in which it was said: "In the spring of 1890, Eugene Cowles, of the Cowles Smelting and Aluminum Company, notified Mr. Hunt that a concern in Boonton, N. J., was manufacturing pure aluminum by the Hall process, and on this hint the New Jersey company was investigated, owned up, and desisted." This appears to have been part of an affidavit of Mr. Alfred E. Hunt, president of the Pittsburg Reduction Company, and the statement seems to have been made of some use in a law suit.

There is but one concern in Boonton which manufactures aluminum in any way, either as "pure aluminum" or as an alloy. That concern is the United States Aluminum Metal Company, of which I am president. That company has never manufactured "pure aluminum by the Hall process," and has never, to its knowledge, been "investigated," has not "owned up," and has not "desisted."

If Mr. Hunt made this statement, he ought to take it back in the manner in which it was made, and cause the retraction to be as widely published as the statement. I shall write him to this effect. But without reference to what he may do in the matter, I trust this denial may be given the same publicity in your journal as was given the article referred to.

W. T. BARNARD,
President U. S. Aluminum Metal Co.

Boonton, N. J., April 20, 1891.

A Good Use for Old Tin Cans.

To preserve rosebushes, cuttings, or any tender plant just set out from crickets or any winged bugs, cut out the top and bottom of tin cans and place the cylinder over the plants, and keep them there till the plants get strong enough to resist the attack of bugs.

Cutting a Millimeter Thread with an Inch Leading Screw.

It is possible that many who possess a screw-cutting lathe with a leading screw of so many threads to the inch may wish to use it for cutting millimeter screws. While, of course, it is too much to expect that the absolute value of the millimeter, as given in terms of the inch, can be obtained by ordinary change wheels—and this is not of great importance, since, among other reasons, the two determinations of the value of the millimeter in inches differ by one part in a hundred thousand—yet it may not be well known that a most remarkable degree of accuracy may be obtained with wheels in ordinary use. After some trouble I lighted upon the following numbers, which, with a leading screw of eight threads to the inch, give as a result 25·3968, whereas the inch is 25·3995 millimeters. The wheels are 28 on mandrel, 100 and 36 on stud, and 32 on screw. The error would, therefore, with a perfect lathe, be less than one part in nine thousand, so that a screw cut in this way would for almost all purposes be correct; in fact, it is doubtful if in the case of short screws many lathes could be trusted to cut inch threads more accurately. For leading screws of other pitches, such as 4, 5, 6, or 10 threads to the inch, the wheels can easily be altered so as to give the same result.

Of course it may be the case that this or an equally good arrangement is known to some; but as I had to start working out the combinations of thirteen wheels taken four together, in which each combination contained six sub-combinations, in order to obtain the result, it is possible that it may be appreciated by those to whom it may be of use, but who would rather be saved so much trouble. C. V. BOYS.

Royal College of Science, London.

P. S.—It may be worth while to add that the wheels taken in order—

	28 ..	*100* ..	36 ..	*32*	with	*8*	threads	to the inch.
are the same as	28 ..	*32* ..	36 ..	*100*	"	*8*	"	"
or as	7 ..	*8* ..	9 ..	*25*	"	*8*	"	"
or as	7 ..	*8* ..	9 ..	*10*	"	*20*	"	"

where the followers or multipliers are printed in italics. The last sequence of figures is sufficiently curious, and is one that can easily be remembered.—C. V. B.—*Nature.*

The Mercury Cure for Phylloxera.

PROFESSOR C. V. RILEY,

Department of Agriculture, Washington, D. C.:

The SCIENTIFIC AMERICAN, of this city, published, the 10th of June, 1885, that Mr. John A. Bauer, of San Francisco, Cal., had found a sure and cheap preventive of the ravages of the phylloxera, which consisted in the application to the vine plant of a compound of half an ounce of quicksilver in very minute particles and an equal weight of pulverized clay. The quantity of the mixture had to be half an ounce for each plant. The journal added that the remedy was simple; that it could be prepared, assayed for several purposes, and applied without danger or technical skill.

I consequently wrote to my friends, Mr. John B. Prat and Mr. Paul Griñan, of Barcelona (Spain), on the subject, and I invited them to give a trial to the important discovery of Mr. Bauer.

Mr. Prat wrote to me subsequently what follows:

"I have the deep regret to inform you that our friend, Doctor Griñan, has tried for one hundred times at least to prepare the anti-phylloxera compound discovered by Mr. Bauer in San Francisco. He, Mr. Griñan, has used all the means that science and experience advise, but to no avail, because he has not been able to obtain the assimilation of the mercury and the clay. There must therefore exist either an especial machine or an ingredient unknown so far to us for making the anti-phylloxera preparation, and we earnestly beg of you to inquire about the matter and inform us."

I consequently wrote to Mr. Bauer on the 3d of last March, and up to this day I have not received an answer whatever.

A friend of mine, Mr. MacArdle, who knows you by your high reputation as the best judge in the phylloxera question, has advised me to take the liberty of consulting you on the matter, and it is for this reason that I come to beg of your extreme kindness the favor of informing me how can my friends in Barcelona succeed in making the compound invented by the above-mentioned Mr. Bauer, or whether there is any other practical and easy way of destroying the dreadful phylloxera.

Thanking you earnestly in advance for your trouble, I beg to remain, sir, yours very respectfully,

JOSEPH DE SUSINI.

New York, April 7, 1891.

Reply by Prof. C. V. Riley.—I have your letter of the 7th of April, referring to Bauer's quicksilver remedy for grapevine phylloxera. This remedy was proposed in 1884 and attracted considerable attention at that time. So far as I am aware, Mr. Bauer has not published his method of mixing the earth and the mercury. In Bulletin No. 18 of the Agricultural Experiment Station of the University of California, published October 1, 1884, Professor E. W. Hilgard, in treating of this remedy, says there can be no doubt as to the efficacy of metallic mercury finely diffused through the soil in killing phylloxera or any other small insect remaining within its reach for any length of time. In another paragraph of the same bulletin he makes use of the expression, "A soil column of six or eight inches depth, impregnated with the mercurial vapor by intermixture with 'blue mass,' will effectually prevent," etc. In other words, the mixture is spoken of as a simple mechanical operation, and I was not hitherto aware that there was any difficulty with that phase of the application. I was not at all favorably impressed with the remedy at the start, and the experiments made later by Professor Hilgard and his assistants failed, in a large majority of cases, to produce the expected effect. Mr. Bauer's original idea was to place a small quantity of the mixture about the base of the vine, to prevent the underground forms from crawling up, the vapor killing all individuals which attempted to do so. The obstacles to success are, in the first place, that by no means all of the lice crawl up the main roots, but issue from the ground from rootlets near the surface and crawl away to other vines; and in the second place, that soils of differing characters have very different powers of absorbing the mercurial vapor, becoming impregnated to different degrees or not at all.

I regret that I can give you no more definite information as to the method of preparation, but in view of the comparative success of the latest French work with the American vine and bisulphide of carbon injected subterraneously, and in view of the discouraging results of Professor Hilgard's California experiments with Mr. Bauer's mixture, it seems to me that it would be hardly worth while for Dr. Griñan to spend any further time with this mercury preparation.

April 14, 1891.

Good Roads.

At a recent meeting of the Engineers' Club of Philadelphia, Mr. Thomas G. Janvier read a paper on "The Engineering Features of the Road Question."

This branch of the road question should be divided into three parts: 1st, location; 2d, preparing the road-bed; 3d, laying the pavement.

Location.—The item of expense should be well considered. In this connection, grading, land damages, etc., should not be overlooked. The line should be as direct as possible, remembering that a slight deflection to the right or left, or an easy curve, might save considerable expense in the matter of excavation, embankment or bridging. The grades should be made as easy as possible, not exceeding seven feet per hundred, or less than eight inches per hundred feet. Excessive excavations and embankments should be avoided.

The full width should not be less than forty nor more than sixty feet, but the paved portion need only be from eighteen to twenty-four feet.

The road-bed, or sub-grade, should have the same shape as finished grade.

Pavement.—If intended for very heavy travel, the Telford pavement should be put down, but if for ordinary travel, McAdam will answer. The difference in cost of these two pavements is but slight, and the Telford being much superior, should be given the preference.

A Telford or McAdam road thoroughly constructed and properly maintained will never need reconstruction. The best system of maintenance is that of constant daily attention and repairs. All dirt roads intersecting a paved road should be paved several hundred feet from the intersection, in order that as little mud and dirt as possible shall be carried on to the paved road.

Important points to be observed for keeping a road in good condition:

1. All dirt and mud removed as frequently as possible.
2. The entire drainage system carefully maintained.
3. Constant daily repairs and patches wherever and whenever ruts or depressions begin to show.
4. Careful sprinkling three or four times a day in dry weather.
5. The frequent use of a two-and-a-half-ton roller.

Soap for Metal Work.

The soaps used for cleaning metal work usually consist of mixtures of vaseline, oleic acid, and fat, mixed with a small quantity of rouge. When freshly prepared, they leave nothing to be desired; but, unfortunately, such mixtures soon turn rancid, and become unfit for use. A new soap for metal work, which is stated to be free from this objection, is made from cocoanut butter in the following way: 2·5 kilogrammes of the butter are melted in an iron vessel, together with a little water, and to the mixture is added, with constant stirring, 180 grammes of chalk, 87·5 grammes of alum, 87·5 grammes of cream of tartar, and 87·5 grammes of white lead. This mixture is then poured into moulds and allowed to solidify. The soap so obtained is made into a paste with water and rubbed over the metal to be cleaned, and finally removed by a dry rag or chamois leather.

LARGE SHIPMENT OF AMERICAN LOCOMOTIVES TO AUSTRALIA.

Sending locomotives to Australia is nothing new in the history of American industrial development. Many have gone there as well as to other British colonies. But strenuous attempts have been made of late to direct this trade to English shops; a plant with English machinery and models has been established on the ground, with the avowed purpose of remodeling the English type of locomotive to suit the conditions of Australian service, and comparative trials have been made between American and English construction. In the face of this, that a large order should be sent hither is an interesting fact. The locomotives shipped by the Baldwin Locomotive Works on the steamer Henley to the government of New South Wales are 27 in number, while the total order received by the Baldwin Works amounts to 47 locomotives in all. Of the first lot, fifteen are light tramway locomotives intended for passenger service on the Sydney tramways. The other twelve are heavy passenger locomotives of what are known as the ten-wheel type, with three pairs of driving wheels and a four-wheeled leading truck. They have separate eight-wheeled tenders. The general dimensions of these locomotives are as follows: Total weight in working order, exclusive of tender, about 125,000 pounds; weight on forward truck, 28,000 pounds; weight on driving wheels, 97,000 pounds; approximate weight of tender with full supply of coal and water, about 80,000 pounds; cylinders, 21 in. diameter by 24 in. stroke; driving wheels, 61 in. diameter; gauge of track, 4 ft. 8½ in.; water capacity of tender, 3,600 gallons. The boilers are of steel, 62 in. diameter, with copper fire-boxes, copper stay-bolts and brass tubes. They are covered with magnesia sectional lagging similar to United States dynamite cruiser Vesuvius and other United States war vessels of recent construction. The driving-wheel centers are of wrought iron forged by a novel process developed at these works. The truck and tender wheels are steel-tired. The engine and tender are fitted with Westinghouse equalized pressure driver brake fixtures, which are actuated by brake equipment supplied by the Westinghouse Air Brake Company, limited, of London. As most of the locomotives on the New South Wales railways are equipped with the English apparatus, it is preferred to that made at Pittsburg. The driver and tender brakes can also be operated by powerful screw apparatus. The reversing gear is operated by a screw, in accordance with the English practice. The locomotives are also equipped with United States metallic packing, Nathan sight-feed lubricators, special lubricators for oiling the driving boxes for high-speed service, and other latest improvements.

The service for which these engines are intended is described by the following extract from a letter from the Secretary for Railways: "The sharpest curve on our road is 528 feet radius (nearly 11 deg). The steepest grade is 176 feet per mile. It is proposed to haul with this engine trains weighing 152 gross tons (340,500 lb.) up long grades of 130 feet per mile. This would be the usual train, and we expect it to be hauled up this grade at about 22 miles per hour. Occasionally the train would have an additional car, making the load without engine and tender 176 tons, or 394,240 lb. These loads include a full complement of passengers, mail and baggage. The cars are all on trucks or bogies.

"The regular load up the 176 feet grades would be 120 gross tons (269,000 lb.) without engine or tender. These grades are free from very sharp curves, and therefore in practice a greater proportionate load can be hauled than on the 130 feet grades. It is therefore expected that occasionally an extra car could be handled, making the total weight of the train 144 gross tons (322,500 lb.) without engine or tender."

An engineer, William Rhodes, of the Baldwin Company will supervise the erection and trials of the locomotives in New South Wales.

John H. Converse, of Burnham, Williams & Co. (Baldwin Locomotive Works) in a recent conversation with a representative of the SCIENTIFIC AMERICAN said:

"There is not anything particularly novel in the dimensions or construction of the locomotives which we are shipping to the government of New South Wales. As far back as 1877 we exported locomotives to Australia. The American type of locomotive is undoubtedly the best type for Australia, and no one knows this better than the Australians.

"This is proved by the fact that usually when they want a locomotive they either order it from American builders, or else have an English-built locomotive modified by American designs. The American locomotive is peculiarly adapted for use in Australia on account of the general topography of the country. The English locomotive has a plentiful lack of flexibility in its make-up. It is a good engine in insular England, but not in continental Australia. The English locomotive is made to run on short, straight, and level roads, and is inferior to the American locomotive wherever the topography of the country requires a twisting and bending of the road, sinuous paths and sharp corners. The Australian likes the superbly balanced American locomotive, the ease with which it accommodates itself to tortuous roadbeds. They like the accessible position of our cylinders, the good 'kite' which the sand boxes afford the driving wheels. And they know that on a good road the American locomotive is the equal of the English locomotive, while on a poor road the English locomotives are like the man who drove the hearse—they are not in it. As to relative cost, from all the data that I can obtain, I am of the opinion that at present an American locomotive can be delivered in Australian ports at about the same cost as an English locomotive."

It may be said, however, that the relative cost of the two types, American and English, is not as important a factor in this discussion as adaptability. A locomotive that will fulfill the conditions of service easily fetches a fair price, while a locomotive which will not do this is costly at any price. It is only fair to add, lest a wrong inference should be given, that the English type of locomotive, though wholly unsuited to long, uneven and tortuous roads, such as obtain in newly settled countries, is yet an admirable design for the short and smooth and highly perfected roads of Britain. It would be manifestly unfair to compare the work of English locomotives on American roads or American locomotives on English roads, but on neutral ground like South America, Japan and Australia, where both are asked to fulfill the same conditions, the same being quite unlike what they have been used to, there is an excellent opportunity to test the relative skill of the two designers. Notwithstanding our tariff restrictions, American locomotives have found a ready market in those regions, while in Canada they long since drove the English type out of the market.

It has been asserted, and without contradiction, that the English locomotive burns less coal than the American. But the American locomotive does more work than the English. It could not reasonably be expected that locomotives pulling heavy loads on uneven roads with high grades should be as saving of fuel as engines pulling less, for their weight, along smooth, short, and perfectly constructed road-beds. The freight locomotive in England works under unusually favorable conditions. Once it starts on its journey it has the right of way, and there is rarely any reason for stopping it. The American type has much more to contend with. It draws a much heavier train, often 50 cars, or 4,500,000 lb. Nor is that even a maximum load. On the Pennsylvania it is sometimes 80 and 85 cars. To start such a train and obtain a headway of 40 miles an hour, it has been computed to require a net pull (friction excluded) of 243,000,000 foot-pounds, a force that would serve to have hauled the train quite three miles on the level. Having frequently to stop, often to move off upon a siding to let passenger trains go by, and running upon roads which, because of their enormous length, it is almost impossible to keep in good repair, American locomotives are called upon to withstand frequent and severe strains. English locomotives, when put to such tests, have failed signally; nor do the English designers, even when forewarned that they must fulfill such conditions, prove equal to the emergency, the trials between American and English freight engines in South America and Australia proving conclusively that those brought up in the American school of designing most fully appreciate the serious nature of the obstacles to be encountered.

A good illustration of the inadequacy of English locomotive designing to fulfill conditions of service on other than English roads was recently had on the Pennsylvania road, where an English locomotive of the compound type, built at large cost especially to compete with American passenger service locomotives, was found unable to draw the regular trains, nor was the boiler capable of evaporating as much water per pound of coal as the American-built engines performing the same work.

In the British colonies, as in America, it has been found advisable, indeed most economical, to run heavy trains, the present tendency being to increase both load and speed. Whether this system is the best it is not the purpose of this article to inquire; it is sufficient to state the fact that that is the character of the service demanded of the American locomotives now being sent to New South Wales, and it is that kind of service that has reduced the average rate of freight service in America to less than half of that of English, French and Italian roads, and about 65 per cent of the rate charged on German roads. In a recent discussion of the relative heating surface of American and English locomotives, per ton of adhesion weight, the heating surface of certain standard engines was given as follows:

Pennsylvania, class A	1,052 sq. ft.
" " A, anthracite	1,205 "
" " P	1,330 "
Chicago, Burlington and Quincy, class H	1,506 "
Michigan Central, 10-wheel express	1,670 "

The mission of these engines is to draw express trains of between 300 and 500 tons weight. With English types the heating surfaces are as follows:

London, Brighton and South Coast	1,500 sq. ft.
Webb Compound	1,457 "
Worsdell	1,139 "

But it must be remembered that English train loads scarcely average 200 tons.

A New Discovery Wanted.

"It does not appear at all probable that electric lighting, carried out on the present lines on a large scale, will ever be cheaper than gas lighting. Its superiority in so many other respects to gas lighting may ultimately lead to its very general adoption, but it must be obvious to everybody that complete success cannot be hoped for until some entirely new system, by which a greater proportion of the available energy is converted into light, has been discovered. In a gas flame not more than one per cent of the energy consumed appears in the useful form of light; and in the electric arc (our most efficient form of artificial light), the proportion of useful effect is only raised to 2 or 3 per cent. The remaining 98 or 97 per cent being below the limit of the visible spectrum, is wasted in the form of invisible heat. Light waves produced by combustion or incandescence are invariably accompanied by an enormously larger proportion of waves of a lower pitch, which merely produce heat; or as Dr. Lodge puts it, 'it is as though, in order to sound some little shrill octave of pipes in an organ, we were obliged to depress every key and every pedal, and to blow a young hurricane.' The writer just quoted also predicts that a boy turning handle could, with his energy properly directed, produce as much light as is now produced by the consumption in massive mechanism of large quantities of fuel."

Certain recent investigations by Langley and Very with spectroscopic and thermal estimations were made, and the result was to show that the whole of the radiant energy of the firefly lies within the visible spectrum. No radiant heat, below the red end of the spectrum, could be detected by the bolometer, an instrument which has proved sufficiently delicate to measure the thermal radiation from the moon. It was concluded that insect light is associated with about $\frac{1}{400}$ part of the heat which is ordinarily associated with the radiation of flames. "Nature thus produces light at about $\frac{1}{400}$ part of the cost of the energy which is produced in the candle flame, and at but an insignificant fraction of the cost of the electric light."

These investigations of Langley and Very are of the greatest interest as showing that the attainment of an enormously higher efficiency in the production of artificial light is contrary to no law of nature, and may suggest a system of electric lighting destined to supersede the enormously wasteful methods at present in use.—*Electrical Review.*

Electrical Properties of Semi-permeable Walls.

A semi-permeable material, according to Ostwald, is a material which permits the solvent to pass through it, but not the dissolved salt. The permeability of a given material, however, depends not on the nature of the given salt as a whole, but upon the character of each of its ions. Copper ferrocyanide, for example, is permeable by potassium chloride, because it allows both the potassium and the chlorine ions to pass through it. But it is not permeable by barium chloride because it does not permit the barium to pass, nor by potassium sulphate because it does not allow the passage of the SO_4 ions. If a solution, the ions of which cannot pass through a semi-permeable material, be electrolyzed, the electrodes being separated by a semi-permeable wall, the latter will itself act as a metallic electrode. In the author's experiments, a U-tube filled with a solution of potassium ferrocyanide and having parchment paper tied over its ends was used to connect two glasses containing solution of copper sulphate, so that a layer of copper ferrocyanide formed on the paper. After passing a current through the apparatus for a time, metallic copper was found to be deposited on the paper in the glass containing the positive electrode.

The fact seems to be that the positively charged copper ions, coming in contact with the film of ferrocyanide, through which they cannot pass, give up their charges and are deposited in the metallic state; the negative $FeCy_6$ ions, accumulating on the other side of the film and there giving up an equivalent of negative electricity, are converted into triad ferrocyanide ions. At the other film the potassium ions, permeating the copper ferrocyanide film, pass through it and establish electrical equilibrium by uniting with the SO_4 ions of the copper sulphate. The author thus explains Becquerel's observation that when a tube containing copper nitrate solution is placed in a solution of sodium sulphide, a deposit of copper takes place in the interior of the tube. He also shows that many electrophysiological phenomena may be explained in this way, by the action of semi-permeable materials; such, for example, as the secondary resistance of albumen noticed some years ago by Dubois Reymond.—*Zeitschr. physikal. Chem.*, vi., 71; *J. Chem. Soc.*, lviii., 1354, Dec., 1890.

THE BENNETT DREDGE AND AMALGAMATOR.

Placer mining in America, of late years, has been so unsuccessful and expensive that it seems to have become almost entirely abandoned in many good paying districts. One reason is because the miner or prospector prefers a "lead" or a "prospect," something where the returns appear to be greater, quicker, and more permanent than "so many colors to the pan," "so many cents to the yard of gravel," and the hard work of handling water and bowlders. There appears, however, to be a prospect of the return of many "old timers" to this branch of mining, not on account of better pay, but principally for the reason of the advancements in methods and machinery for the saving of the precious metal, the new finds on old grounds, and the late discoveries of entirely fresh fields in Idaho, Utah, Arizona, New Mexico, California, Colorado, Old Mexico, Australia, and other sections. Many new devices for the handling and saving of gold in this condition have been, and are being, continually experimented with by prominent and capable men, who believe that money can be made from the bars and other like deposits containing gold, as was done in 1849. In this connection we illustrate and describe a process that has been before the public for some time in California and Colorado, and which is now brought to a practical shape. The work done by the machinery is of sufficient importance to attract the attention of placer miners, on account of the fine gold it saves, as well as the coarse, and for the new and advanced construction of the entire plant.

This plant consists of the Bennett amalgamator, dredge, electric plant, and power house. The machines are built in three sizes. No. 1 has a capacity of 2,000 yards per day, No. 2 has a capacity of 4,000 yards per day, and No. 3 has a capacity of 8,000 yards per day. They are built of steel, and are adapted for handling cemented gravel and bowlders. The dredge is arranged to be propelled forward or backward on a screw, or on its own track, by its own power (as will be seen in the engraving, which shows a No. 1 machine). Mounted on the dredge are four electric motors, one of which handles the dipper, another lifts it through its cut, a third swings the dipper to the hopper, while the fourth operates the amalgamator which is upon the rear of the platform. The features of the dredge are its simplicity, absence of any necessity for stays and braces, and the ability to swing the dipper through a circle, there being no interference from stays or braces. The motors are operated by switches conveniently placed in the rotating cab, and all are under the perfect control of a single operator. These switches are so arranged and connected with an electro-magnetic brake as to reduce the number of levers requisite to thoroughly control all the operations of this plant to three, thus enabling one operator to easily control the operations of the entire plant, even of the largest capacity.

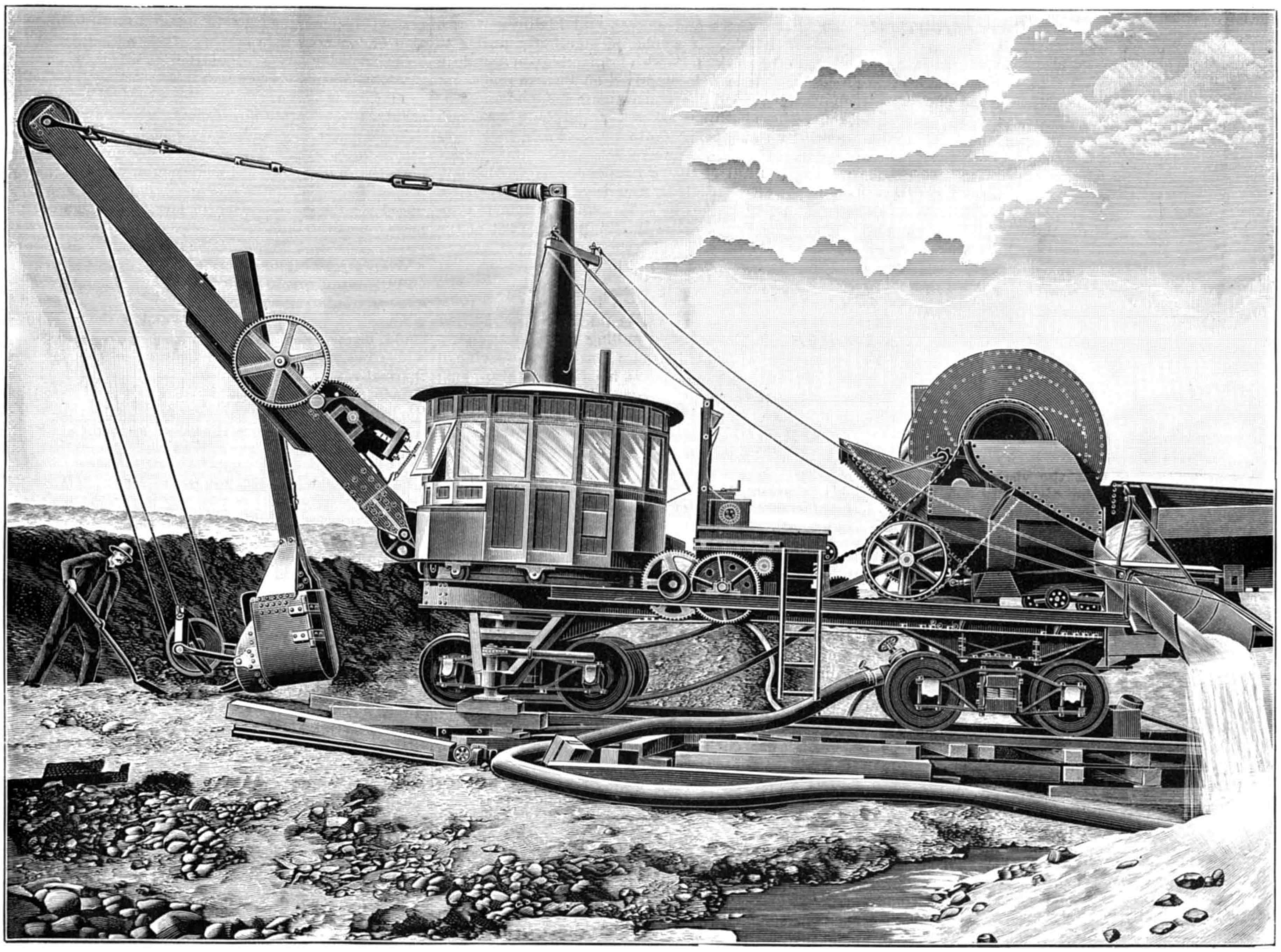
The dredge is mounted upon its own truck or car and can be moved forward or backward by simply turning a switch. Both it and the amalgamator are constructed throughout of steel and aluminum iron, graphite bearings being used throughout the plant to obviate the use of grease or oil. Chains are replaced by steel wire ropes and gears are rendered unnecessary through the system of reduction in speed being adapted to the work performed.

The dredge illustrated, and which is taken from a photograph showing it at work near Denver, handles with ease two dippers per minute, in hard cemented gravel and bowlders, such as are usually found in placer ground. At the point shown the dredge had dug at least three feet below the track to clean low bedrock, and at times cut its way through high bedrock. The dipper dredge has a capacity of a cubic yard, and automatically opens and closes at the proper points. The weight of a No. 1 dredge, without amalgamator or motors, is about 25 tons.

The amalgamator, seen on the body of the dredge, consists of a cylindrical separator, set upon a peculiarly shaped tank, which is lined throughout with amalgam plates of new construction. It receives the water from numerous jets so placed in its bottom as to cause each particle that enters the tank to be thrown upward and toward the plates a sufficient number of times to insure not less than 400 contacts with the mercury held in bulk and otherwise, by the peculiar formation of the plates, and further, each particle, in its transit from the inlet to the outlet of this tank, is subjected to twelve severe scourings, by means of which coated or rusted gold is prepared for instant amalgamation, and in its transit each particle is placed twelve times in comparatively still water, thus allowing gravitation its perfect action. This machine is so constructed as to entirely avoid the flowering of mercury, and to prevent the usual loss through this cause. In fact the amalgamator can be profitably used for the recovery of the mercury and amalgam so lost. A full description of the amalgamator and its mode of operation would require more space than is at our disposal, but it may be explained that the dipper discharges its contents into the cylindrical separator, which traveling in water thoroughly screens out and washes the coarser parts that are discharged at its opposite end through a shoot or otherwise on to the previously cleaned up bedrock, while the pay dirt, sifted through the separator, enters the tank, where it is subjected to the treatment above referred to, and is then discharged, by means of the tailing wheel, into the overflow water, whence it may be conveyed by pipes or sluices to any desired point for settling and reuse if necessary, or may be thrown upon the cleaned up bedrock of a previous cut. In a high breast it becomes necessary to employ a carrier to pile the tailings higher, it being understood that the machine is constantly moving away from these piles.

The power employed may be generated either by steam or water, but electricity is preferred for many and obvious reasons. The plant is adapted to run day and night, and is supplied with the proper electric lights; a 30 horse power engine is required to run this No. 1 plant, exclusive of pumping. The water necessary is 80 miner's inches, kept in circulation through its jets, but it is capable of treating its full quantity of stuff with from 1 in. to 3 in. of supply, by using the water over and over, which it is arranged to do, when necessary. In fact, it may be mentioned that the machine illustrated has been worked near Denver for several weeks on less than a miner's inch of supply. Where the power is generated by water, the necessary staff consists of but three men, two of whom are laborers; the same number of hands are required for the other size of machine. The maximum capacity of the plant is stated to be 1½ yards a minute.

The time required for an ordinary clean-up need not exceed two hours, and may be made daily, weekly, or monthly. The tank can be provided with a steel cover, which can be furnished with a lock, so that no one can interfere with its contents. The ground upon which this plant has been operating has been variously estimated as paying from 7 to 10 cents per yard, but by the process we have described about 40 cents were extracted for each yard handled, 75 per cent. of which was in particles so fine as to be invisible to the naked eye, and so light as to be held in suspension in otherwise clear still water several minutes. The amalgamator, like the dredge, is built of steel and aluminum iron, all its journals being provided with graphite bearings; the only wearing points are the cylinder and tailing wheel, each of which can be replaced on the ground in an hour or two. The largest machine is evidently best adapted to river bed dredging, its capacity being 8,000 yards per day at a cost of operating of less than 1 cent per yard. The machine is made by the Bennett Amalgamator Company, of Summit Co., Colorado.—*Engineering.*



ELECTRIC DREDGING AND AMALGAMATING MACHINE.

A HANGING GARDEN AND A MODEL OFFICE BUILDING.

BY H. C. HOVEY.

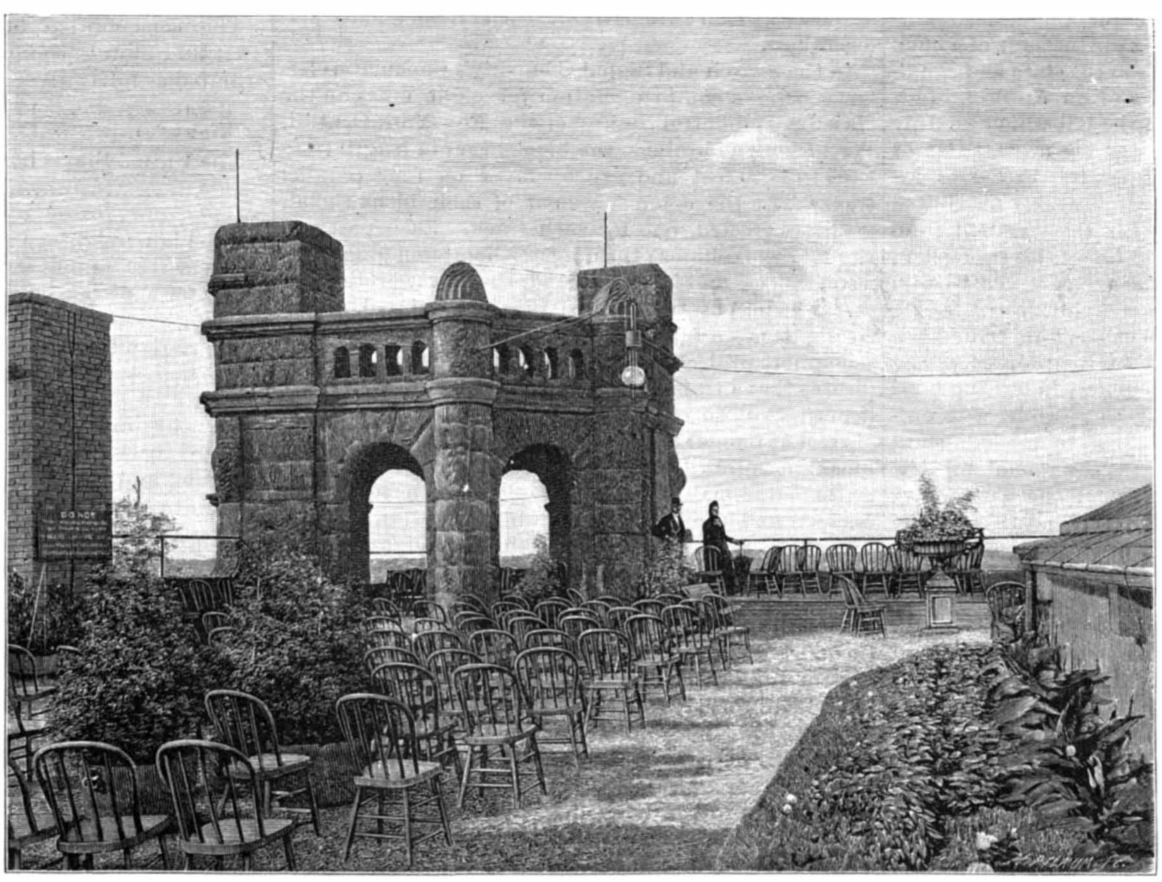
Circumstances have combined to make the city of Minneapolis remarkable in an architectural way. There is its location, to begin with. The broad sandy plain on which it lies reaches from the gorge of the Mississippi River back to Lakes Calhoun and Harriet, a breadth of about four miles. Lengthwise it extends from a rolling prairie whose hills are crowned by charming homes, nine miles southward to the cliffs around Fort Snelling. Underneath the surface of sand and loam is the Trenton limestone, on which rest the solid foundations for the great mills and other massive edifices, while the compact sand is firm enough to support lighter structures. Hence there is no need of the costly digging and blasting that makes similar work elsewhere so expensive. Excavations for cellars, sewers, water pipes, etc., are made at a comparatively light outlay. Then, again, every kind of building material is at hand, and of the very best quality. There is abundant clay for manufacturing the cream-colored bricks that give the city such a sunny look. The limestones and sandstones of the region are noted for their admirable variety of color and texture. Granites can be had capable of standing, by actual test, nearly double the pressure of those quarried along the Atlantic coast. The vast forests of the Northwest furnish every kind of lumber desired, whether for construction or for finish. The numerous glass works of the West make plate glass so cheap that almost every house makes use of it. It is safe and in every way practicable to pile up edifices to a height that might be hazardous if less durable and compact materials were used. Still another favorable consideration is the fact that the wisdom and good taste of the founders of the city were shown in the laying out of the original streets and avenues with ample width, varying from 80 to 200 feet, thus inviting the erection of costly mansions and public edifices, with the assurance that their noble proportions would not be hidden from observation.

During the past ten years enterprising young architects, who had yearned for a field in which to display their talents, have brought to Minneapolis the freshest and the best ideas and inventions of foreign as well as domestic architecture, besides here and there, it must be confessed, notions rather wild and fanciful. The general result, however, is a city of novel and often brilliant effects, so that the visitor is greeted by surprises whether he pushes along through the crowded business streets, strolls amid the luxuriant parks, or is whirled by the electric railway through the spreading suburbs.

My object in this communication is particularly to describe a model office building recently erected by the Northwestern Guaranty Loan Company, of which pictorial representations are also offered. The building is of immense size, yet combines beauty and grace with the necessary elements of strength and durability. It covers an area of half an acre, and boasts six acres of flooring. Its dimensions are 156 by 132 feet, and its twelve stories rise to the height of 172 feet. The observation tower rises 48 feet above the flat roof, making the total height 220 feet. The first three stories are built of green granite, and the upper nine stories are of red sandstone, and its four sides are finished alike. The interior materials used are iron, brick, terra cotta and antique oak. The building contains 400 office rooms, all heated by steam and supplied with water drawn from an artesian well 750 feet deep, the pipes running in summer through a packing of ice, thus giving all tenants an abundance of ice water free. These offices are arranged in suites, each suite having front windows, steel vault accommodations, and ventilated by the most approved methods. The entire building is brilliantly lighted by 15 arc and 3,000 incandescent lamps, connected by 31 miles of electric wire. It has been estimated that this ponderous structure weighs 100,000 tons. The basement contains a complete system of safety deposit vaults. The public law library, free to all tenants, includes more than 10,000 volumes, with full sets of American and foreign reports, and standard works of the latest and best editions. There are six elegant passenger elevators, besides a special one for freight. The twelfth story is entirely occupied by the Guaranty Loan Restaurant, including the public dining room, private dining rooms, cafes, smoking rooms, etc., elaborately and expensively furnished.

Probably the feature that would strike the visitor as most unique and charming is the beautiful garden on the roof, 172 feet above the pavement, where pygmies seem to be walking, and the street along which toy carriages appear to be rolling. This garden is laid out with handsome gravel walks, beds of foliage plants and rare and lovely flowers. During the summer months band concerts are given here, and it is a very popular resort for sight seers. On a clear day, of which there are so many in this remarkable climate, one can see the entire city of Minneapolis and its environs, with the spires and towers of St. Paul not far away. The eye can follow the windings of the Mississippi to its juncture with the Minnesota River, or, in another direction, look off over a broad expanse of woodland and prairie, amid which are embosomed some of the loveliest lakes in the world.

The architects of this magnificent pile were Messrs. Townsend and Mix, whose intention it was to make this the finest commercial building in existence, and the citizens of Minneapolis think they have succeeded.



A HANGING GARDEN, MINNEAPOLIS.

A WORLD'S fair, in commemoration of the four hundredth anniversary of the discovery of America, will be opened at Rio de Janeiro, under the auspices of the Brazilian government, in November, 1892.

JOHN RUGGLES, FATHER OF THE PATENT OFFICE.

THE FATHER OF THE PATENT OFFICE.

To the Editor of the Scientific American:

The interesting notices in your columns of those whose administration of our patent system in its early stages so largely contributed to its subsequent growth and usefulness seem to suggest some reference to the statesman whose wisdom conceived and formulated the patent bureau as we know it. There is good ground for belief that although the principle of examination of the novelty and utility of inventions for which patent protection was sought was recognized in the act of 1790, the plan of providing a special corps of examiners originated in the mind of Senator John Ruggles. There appears to be no printed record of the words with which this fruitful thought was presented to the Senate, but the writer is so fortunate as to be entrusted by the presenter's son and namesake with Senator Ruggles' notes for his famous motion. The committee asked for in the motion appears to have been forthwith appointed, and on the 28th of April, 1836, its chairman, Mr. Ruggles, presented the report and bill No. 239. The bill was so well thought out as to quickly pass, substantially intact, into law. It passed the Senate June 20, 1836, the House July 2, 1836, and received the executive signature July 4, 1836. Of the scarcely less important supplementary acts of 1837 and 1839 Mr. Ruggles was, in like manner, the author. Notwithstanding the mover's recognized personal weight, his bold prediction that "there will probably be no less than 1,000 patents sued out the ensuing twelve months," was doubtless received with skepticism by more than one of his listeners. G. H. K.

Washington, D. C., April 13, 1891.

SPEECH OF SENATOR JOHN RUGGLES BEFORE THE UNITED STATES SENATE, FIRST SESSION OF 24TH CONGRESS, INTRODUCING MOTION FOR A COMMITTEE ON PATENTS, DECEMBER 31, 1835.

Mr. President: Having had occasion to transact some business at the Patent Office, I have been led to inquire into the cause of delay which so often attends the suing out of patents, and in so doing, have come to the knowledge of the necessity, which I apprehend exists, of a revision of the laws of Congress relating to this subject. There has been no change or alteration in the laws of Congress providing for the encouragement of useful discoveries and inventions for nearly half a century except extending the privileges to a certain class of foreigners. For a long period after the law was passed under which patents are issued, there were no more than two patents issued in a year. Now there are 800 issued in a year, and they are fast increasing. There will probably be no less than 1,000 sued out the ensuing twelve months. It is not strange that regulations which answered very well at the time should now, under a change of circumstances, require revision and alteration.

One provision of the law of '93 is particularly inconvenient. It is that which requires a patent to be signed by the President, Secretary of State, and the Attorney General. If either of these officers happen to be absent when an application is made, the applicant is delayed until his return, or the patent must be forwarded to him wherever he may be. Such is very often the case in respect to the present Attorney-General. He is now in the State of New York, and I understand that it now requires some two or three months to get a patent through all the modes and tenses necessary to its validity, when, in fact, it ought not to take more than two or three days. It is a very inconvenient and unnecessary formality.

Again, sir, there is no discretion given to any of the officers of government to refuse a patent when applied for, though the subject of it be neither new nor useful. The suing out of a patent is a mere ministerial duty. The consequence is that patent upon patent for one and the same thing, with, perhaps, some immaterial alteration, is granted to different persons, and thus a foundation is laid for contention and litigation. I understand, sir, that it is not infrequent for a visitor at the model room to take a drawing and description of a model there, and making some slight immaterial alteration, go into the superintendent's apartment and request a patent. He is told that the same thing has been already patented, but that does not deter him from his purpose, he demands a patent, and the minister of the law has no alternative but to make it out. And what does he do with it? Why, sir, he goes forth into every section of the Union and fraudulently sells out the right to make, use and vend in the States and counties to those who are ignorant of the piracy and who are led to confide in the seal of the United States and the signatures of the high officers of the government. This has got to be a regular business, and these fraudulent sales of void patents are estimated to amount to the incredible sum of half a million of dollars annually. And the government is made accessory to this extensive fraud by lending, in accordance with the law, the great seal of State and the signatures of its highest officers to these speculators in patent rights. Sir, it should not be so. What remedy is there? How can it be prevented? That is the inquiry which the resolutions propose to refer to a committee. There are other evils growing out of the present system, which, if not as flagrant, are yet sufficiently palpable to demand correction.

Mr. President, while the progress of the arts in this country has been rapid beyond all European example, their encouragement, so far as it consists in securing to those who have made useful improvements the benefit of their discoveries and inventions, seems not to have received that consideration due to a matter which has become of so much public importance. It may be thought necessary, on examination of the subject, to make a thorough reform and reorganization of the Patent Department, and it may be worthy of inquiry whether it should not be formed into a separate bureau, with a Commissioner of the Patent Office, and such subordinate officers or clerks as may be required for the proper execution of the duties of the department.

BRIEF LIFE SKETCH OF SENATOR RUGGLES, AUTHOR OF ACTS 1836–37–39. BY HIS SON, JOHN RUGGLES, OF THOMASTON, MAINE.

John Ruggles, son of Isaac and Hepsibeth (Parker) Ruggles, was born in Westboro, Massachusetts, October 8, 1789, graduated at Brown University in the class of 1813, and spent one year in Kentucky engaged in teaching. Read law in the office of Hon. Estes Howe, of Sutton, Mass., and with Hon. Levi Lincoln, Worcester, Mass. Commenced the practice of law in 1815, at Skowhegan, Maine, and removed to Thomaston in 1817. He became eminent in his profession, and was, I am told, not excelled in the State in legal acumen and ability.

In 1823 he was elected representative to the State Legislature, and was re-elected for seven successive years. From 1825 to 1829 was Speaker of the House, and again in 1831, resigning to accept the appointment of a Justice of the Supreme Judicial Court of the State. Resigned his seat on the bench in 1834, to accept the office of United States Senator.

On 31st December, 1835, Senator Ruggles submitted his memorable motion for appointment of a committee "to take into consideration the state and condition of the Patent Office," etc., and on April 28, in his capacity as chairman, reported the bill which on July 4, 1836, became the act that created the present Patent Bureau with its Commissioner and its provisions for the technical examination of applications for United States patents. At the end of his term retired from political life to resume the practice of his profession, which was continued until the age of seventy-seven years and only relinquished in consequence of failing health and inability to attend court; but, being wonderfully industrious and fond of his profession, employed much of his time at his home, in writing legal opinions and clearing up, as far as possible with outside aid, the matter in his hands. In one important case he undertook a very lengthy argument for law court which was said by members of the bar to have been equal to some of his earlier efforts. In early life he delivered many public orations, and contributed extensively to the press. In 1824 he married Margaret, daughter of Captain John George of the revolution. In mechanics he was always very much interested, having a naturally inclined and strong mechanical mind.

In stature he was 5 ft. 7 in., full form, weighing about 150 lb.; dark complexion and black hair.

He died June 20, 1874, at the age of 84 years 8 months and 12 days.

At the destruction of the Patent Office by fire, father heard the alarm and saw from his room where the fire was. He was the first one to enter the building, and opened a door to secure some papers he had left on a table. He seized the papers, but had released his hold of the door, which was being closed by a spring, and could not be opened on the inside. Realizing his danger, he succeeded in getting his hand between the door and the casing at the instant it was nearly closed.

Am unable to give you any information as to the "steps" by which my father's "consideration of the subject of patents grew into the organic act," or "any incidents connected with the conception and formulation of the patent law of July, 1836," but I can readily believe that his fondness for mechanics was what prompted his efforts. During my residence in Massachusetts, and since my father's demise, many of his papers have been destroyed. I have no personal knowledge of the matters in question—was but six years of age when father went to Washington. You may have noticed that my father received a patent for a railway rail May 22, 1837.

The engraving is from a photo. copy of a portrait of my father taken about the time he presented the bill referred to.

Electricity as Applied to Railroading.

In a recent address delivered before the Young Men's Christian Association of the Delaware, Lackawanna and Western Railroad, Mr. P. H. Brangs, electrician of the railroad, gave a very complete account of the various ways in which electricity is applied to the operation of railways. He traced the history and nature of the railway telegraph, and showed how it led to the development of railroad signals, in which the electric current plays a prominent part. Under this head Mr. Brangs gave the following interesting details, as reported in the *Electrical Engineer*.

When the railroads of this country had grown to such proportions that the trains had to be run under short headway, it was found essential to adopt some plan whereby the safety of travelers might be made to depend upon something better than the caution of the engineer, and out of that necessity was developed the block signal.

The first railroad signal that was operated in this country was tested on the old Camden and Amboy Railroad, now a part of the Pennsylvania Railroad system. It was in the summer of 1863 that the midnight train from Philadelphia was filled with wounded soldiers returning home to Eastern hospitals. The train was delayed by a hot journal at Bristol. One hour later the Washington express from Richmond Junction, following it, not knowing of the delay of the preceding train, crashed into it, causing one of the most frightful railroad accidents on record. Mr. Robert Stewart was at that time employed on that road as telegraph superintendent, and was the first man to construct and experiment with railroad signals in this country. Very crude signals were used at first, which were changed from time to time until the present form of semaphores was adopted. In 1870 to 1873 the "block signal" system came into general use throughout the country. The Pennsylvania Railroad Company equipped their entire line from New York to Philadelphia, and during the centennial year a thorough test of its practicability was made. Not a single accident can now be recalled due to the improper or inefficient operation of this system. The different systems now in use in this country are the Sykes or English block, the Union Switch and Signal Company's electro-pneumatic system, the Union Switch and Signal Company's clockwork system, the Black automatic mechanical block system, the Hall automatic electric system, and numerous others.

In the Switch and Signal Company's pneumatic electric block system, in operation for eight miles on the New Jersey Central Railroad, the New York Central, West Shore and others, the blocks vary in length from 1,000 to 1,800 feet and are operated on four parallel tracks. At the commencement of each block signal, posts are erected, one for each track. Each post carries two semaphores; the upper or home semaphore has a square end and is painted red, the lower or distance signal being fishtailed in shape and painted green. At night powerful lamps are used. When the upper semaphore projects at right angles from the post it indicates that a train is on the next block. Whenever it projects at an angle of 30 degrees, the lower one is also set at danger or caution. As the train leaves the block thus protected the upper signal falls, but the fishtail signal remains at caution until the next block is reached and the train is two blocks distant. Each semaphore is connected with a counterweight, so that when left to itself the counterpoise drops by gravity and sets it at danger. Directly below each post is a pneumatic cylinder with a single-acting piston, which is connected by means of a balance lever and connecting rod to the semaphore arms. As arranged, the piston which works with the cylinder is pressed upward to its highest position when the semaphore is set at danger, this, therefore, being the natural position of the whole apparatus.

At the top of the cylinder a valve is arranged which can be opened electrically, and which closes automatically by a spring. To this valve a pipe is connected which communicates with a supply of compressed air. Above the valve is an electro-magnet, the armature of which is connected to the valve stem. If a current of electricity is sent through the magnet, the valve will be opened, compressed air will be admitted above the piston, which will be depressed, and as it goes down will force the semaphore, in opposition to the counterpoise weight, into the "safety" position. The object to be attained, therefore, is that when a train is on the block in advance of a set of signals, it must, automatically, cut off the current from both, so that they will be drawn into the "danger" position. When the train is on the next block, the current must again be permitted to pass through the upper semphore magnet, forcing it into the "safety" position, but no current must be admitted to the lower semaphore magnet until the second block has been passed.

Another block system which has been quite extensively introduced on the roads of this country is known as the "Hall system." It was first used on the Eastern Railroad (now Boston and Maine) in 1871. In this system the signal is now operated on a closed circuit, running from the battery through the block track instrument, through the magnet of the signal instrument, through the points of the relay, through the relay magnets and back to the battery, thus completing a circuit which holds the signal to safety simply by the action of the current. By the momentary breaking of the circuit caused by the passage of a train over the closed spring track instrument, the magnets of the relay are demagnetized, the points are separated and the signal falls to "danger" by gravity from lack of force to sustain it in the "safety" position. It will also be seen that from any disturbing cause, such as the breaking or crossing of the line wire, the failure of the battery or any of the mechanical parts, the signal will immediately go to danger by the interruption of the circuit. After a signal has been set at danger it can not be restored until the train shall have operated the clear (open) track instrument at the end of the section. The clearing circuit runs from the battery through the open spring instrument, then through the relay magnets, back to the battery. On completing the circuit through the "clear track" instrument, the relay magnets are magnetized, the points of the relay are again brought in contact, the former circuit is therefore completed, and the signal again goes to "clear." If a switch on the main line is misplaced, a circuit is broken in a switch machine attached to the switch, which also causes the signal to fall to "danger." The signal instrument is certainly most simple in construction, consisting of a pair of electro-magnets, between the prolonged coils of which revolves an armature. To one wing of this armature is attached the disk, and to the other its counterweight rod, which, being lighter than the signal, allows of a gravity movement of the signal whenever the force holding it is withdrawn. In the "Hall track instrument" the piston, on being thrown up by depressing the lever, breaks or makes a circuit on the top plate. The piston is operated in an air chamber, which cushions the upward blow and also retards its fall, thus saving all wear to the apparatus.

Mr. Brangs also described the modern system of electric railways and the various applications of lighting, heating, etc., of railroad cars.

The Use of Kainit for Agricultural Purposes.

The Halberstadt chamber of commerce, in its last annual report, gives some interesting statistics as to the use of kainit in agriculture.

The consumption of this article rose in 1889 to 2,634,507 quintals, compared with 2,472,973 in 1888, distributed as follows:

Home consumption	1,503,417 quintals,	against	1,052,368 in 1888
Exportation	1,131,089	" "	1,420,605 in 1888

The United States have imported:

1888	914,350 quintals.
1889	716,700 "

The high freightage rates of the commencement of the year 1889, telling severely on the sale price of contracts for the year, have had a deleterious influence on exportation to the United States, and have caused a retrogression in place of the usual advance.

The increasing favor with which rational fertilization is being regarded has already had a good effect on agriculture, and this practice is ever being more widely adopted by neighboring states. Among these Sweden, Belgium, and France rank first as consumers of kainit.

Kainit is a mineral deposit containing potash, found at Stassfurt, Germany. A good quality contains 12 to 14 per cent of potash in the form of the sulphate K_2SO_4.

Liebreich's Remedy for Tuberculosis.

Cantharidin is Professor Liebreich's remedy for tuberculosis, administered by hypodermic injections. The solution used is made as follows: 0·2 gm. cantharidin and 0·4 gm. potassium hydrate (0·3 gm. sodium hydrate) are warmed with 20 cc. water in a water bath until solution is effected; this solution is diluted with warm water and after cooling made up to one liter. Cantharidin, $C_{10}H_{12}O_4$, is the anhydride of cantharidic acid, $H_2C_{10}H_{12}O_5$, and in the above solution exists as cantharidate of potassium (or sodium), $C_{10}H_{12}K_2O_5$. The initial dose represents 0·1 mg. cantharidin, which is gradually increased to 0·6 mg.; the remedy as yet has only been used in affections of the larynx and is easily tolerated by the system. Professor Fränkel, upon whose patients the experiments were made, emphasizes the statement that the bacilli become scarcer and thinner under the treatment. Its action depends upon inducing a serous transudation in the diseased parts.—*Apotheker Ztg.*, 1891, 122.

A Trade Mark Case.

Supreme Court of the United States. The Brown Chemical Company, makers of Brown's iron bitters, *vs.* Meyer *et al.*, makers of Brown's iron tonic. Decided April 6, 1891.

Appeal from the Circuit Court of the United States for the Eastern District of Missouri.

It is well established that words which are merely descriptive of the character, qualities, or composition of an article, or of the place where it is manufactured or produced, cannot be monopolized as a trade mark.

An ordinary surname cannot be appropriated by any one person as against others of the same name, who are using it for a legitimate purpose.

A trade mark with the words ' Brown's Iron Tonic" upon it does not infringe another bearing the words "Brown's Iron Bitters," when the cartons and bottles in which the two medicines were offered to the public were wholly different in size, color, and appearance, and the labels and wrappers were correspondingly different.

The law does not visit with its reprobation a fair competition in trade; its tendency is rather to discourage monopolies, except where protected by statute, and to build up new enterprises from which the public is likely to derive a benefit. It is only when such competition is based upon fraud that the law will interfere.

The right of the owner of a trade mark to assign the same to a partner or to a successor in business, as an incident to its good will, affirmed.

In Holloway *vs.* Holloway (13 Beav., 209), Thomas Holloway had for many years made and sold pills and ointments under the label "Holloway's Pills and Ointments." His brother, Henry Holloway, subsequently manufactured pills and ointment with the same designation. The pill boxes and pots (of ointment) of the latter were similar in form to, and were proved to have been copied from, those of the former. The Master of the Rolls in granting the injunction said:

"The defendant's name being Holloway, he has a right to constitute himself a vendor of Holloway's pills and ointment, and I do not intend to say anything tending to abridge any such right. But he has no right to do so with such additions to his own name as to deceive the public, and make them believe that he is selling the plaintiff's pills and ointments. The evidence in this case clearly proves that pills and ointments have been sold by the defendant, marked in such a manner that persons have purchased them of the defendant, believing that they were buying goods of the plaintiff."

The principle of this case was approved by this court in the case of McLean *vs.* Fleming (96 U. S., 245), in which a person was enjoined from using his own name, in connection with certain pills, upon the ground that they were put up in such form that purchasers exercising ordinary caution were likely to be misled into buying the article as that of the plaintiff. These cases obviously apply only where the defendant adds to his own name imitations of the plaintiff's labels, boxes, or packages, and thereby induces the public to believe that his goods are those of the plaintiff. A man's name is his own property, and he has the same right to its use and enjoyment as he has to that of any other species of property. If such use be a reasonable, honest, and fair exercise of such right, he is no more liable for the incidental damage he may do a rival in trade than he would be for injury to his neighbor's property by the smoke issuing from his chimney, or for the fall of his neighbor's house by reason of necessary excavations upon his own land. These and similar instances are cases of *damnum absque injuria.* In the present case, if the words are not in themselves a trade mark, they are not made a monopoly by the addition of the proprietor's name, provided, of course, the defendant be legally entitled to make use of the same name as connected with his preparations.

The theory of a trade mark proper then being untenable, this case resolves itself into the question whether the defendants have, by means of simulating the name of plaintiff's preparation, putting up their own medicine in bottles or packages bearing a close resemblance to those of plaintiff, or by the use of misleading labels or colors, endeavored to palm off their goods as those of the plaintiff. The law upon this subject is considered in the recent case of Lawrence Mfg. Co. *vs.* Tennessee Mfg. Co. (138 U. S., 537). The law does not visit with its reprobation a fair competition in trade; its tendency is rather to discourage monopolies, except where protected by statute, and to build up new enterprises from which the public is likely to derive a benefit. If one person can by superior energy, by more extensive advertising, by selling a better or more attractive article, outbid another in popular favor, he has a perfect right to do so, nor is this right impaired by an open declaration of his intention to compete with the other in the market. In this case, the usual indicia of fraud are lacking. Not only do defendant's bottles differ in size and shape from those of the plaintiff, but their labels and cartons are so dissimilar in color, design, and detail that no intelligent person would be likely to purchase either under the impression that he was purchasing the other. There are certain resemblances in the prescriptions and instructions for the use of the respective preparations, but no greater than would be naturally expected in two medicinal compounds, the general object of which is the same.

BATH LIFT FOR THE SICK AND PARALYZED.

Dr. S. A. K. Strahan has described in the London *Lancet* a bath lift for the use of the sick. Our engraving shows the operation of the device, which the doctor indorses in the following words:

"This bath lift, to which I would call the attention of the profession, was designed with a double object: (1) to prevent those accidents which from time to time occur during the bathing of the paralyzed and otherwise helpless, and make the bathing of the most helpless patient by a single nurse at once possible and safe; and (2) with a view to the better carrying out of prolonged immersion—a mode of treatment frequently resorted to at present in various diseased conditions. The accompanying diagram gives a very good idea of the apparatus. It consists of a light, rigid frame supporting a strong net, and raised at the end to form a pillow. This net can be elevated to the level of the top of the bath and lowered at will by means of the handles attached to the revolving bar. A rack-and-pinion arrangement makes it impossible for the net to 'go down with a run,' and the bent crossbars (shown through the net in the engraving) keep the net three inches from the bottom of the bath tub when at its lowest. In use, when the patient is brought alongside the bath, the net is raised, the patient comfortably placed thereon, and gently lowered into the water prepared for him beneath.

BATH LIFT FOR THE SICK AND PARALYZED.

Bathing over, the net is raised again to the level of the top of the bath, the patient rubbed dry, and prepared for bed. Nurses and others who have single-handed attempted to lift a helpless person from the bottom of a bath will be able to appreciate the usefulness of this contrivance. The advantages of the lift in cases of prolonged immersion are many, not the least of which is that the patient is supported in mid-water, his weight being equally distributed, and no portion of his body being allowed to come in contact with the bottom of the tub. Should the patient be delirious or maniacal, the limbs can easily be secured to the net, and all dangerous struggling is obviated. There is sufficient space between the edge of the net and the side of the bath to prevent injury to the fingers should the bather grasp the rods. The apparatus can be made to fit any size or shape of bath, and can be fixed to an ordinary bath in a few minutes. It is also to be noticed that the net and revolving bar can be removed in a moment, so that in a private house the bath may not be monopolized by the invalid. The machine should, I think, prove of great value both in the private house and in the public institution."

A Week without Sleep for a Wager.

At noon on Monday, March 30, in Detroit, Mich., six men entered into a competition to test their ability to do without sleep for a period of 168 hours, or a full week. Four of the contestants had dropped out before Thursday, the two remaining being Townsend, a six day walker, and Cunningham, a ship carpenter. Townsend succumbed on Sunday evening, and the manner of his failure, and the great difficulty experienced by Cunningham in keeping up his vigil for the full period, afford a vivid illustration of the exquisite torture which can be inflicted by forcibly depriving one of sleep. At about 10 o'clock Townsend began to weaken; he walked like a man asleep and reeled about the floor. An hour later he complained that the floor had all at once grown very steep and he could not keep on climbing. He stuck to his task, however, until midnight, when he leaned against the wall for a moment's rest. He was so tired that he fell to the floor. The shock roused him, and he begged the watchman to keep him awake, but it could not be done. Again he reeled about the floor for a few minutes and then with tears in his eyes he said it was all up with him. He could not stand it any longer—he must lie down a minute. Down on the floor he threw himself, and before the watchman could get to him, a full-fledged snore was heard, and he was out of the race.

Cunningham was left alone with a 12 hours' vigil before him. He walked, he sang, he danced and shouted and tried every means he could devise to ward off sleep. Hundreds of people clustered about him to see the last hour pass. "Why did you stop the clock," he almost screamed as the minutes dragged by. At length it was over, and he was conducted to the theater stage and introduced, but before the introduction was over, he was sound asleep. Cunningham lost eight pounds and Townsend six in the match. The men were allowed to sleep in 15 minute naps at the conclusion of their several vigils, and were said to have suffered no permanent ill from their novel contest.

Liquid Fuel for Firing Porcelain.

The large porcelain factories at Limoges have been for a long time studying the question of reducing the price of fuel, the existence of the famous industry being threatened by the excessive cost of firing china. While in Bohemia this is not more than $2 per ton, and in England $2.60, at Limoges the cost was $6.90. In order to compete against this immense advantage, wages were reduced to the lowest minimum, and still the manufacturers, in many cases, lost money. The coal that is employed is necessarily costly, as a smokeless, long flame variety is required. Many of the factories burn wood only, as that produces a purer white than the very best kinds of coal. Wood, however, is dearer than coal, and is consequently only used in firing the muffles and in the finest grades of porcelain. Under these circumstances one of the most progressive houses in Limoges was induced to employ petroleum or residuum oil as a fuel. To accomplish this an American firm using the Wright burner was requested to come and make a trial with the fuel. The results were far better than anticipated. No gases or smoke in any way discolored the china, which came from the kiln much whiter and in better condition than when it is fired with the best of wood. In the muffles there was a most decided advantage. The delicate colors, which show at once the presence of the slightest quantity of gas, were perfect. This new discovery, according to a recent consular report, promises to revolutionize the whole porcelain industry. It is estimated that by employing these oils there will be a reduction of about 15 per cent or 20 per cent in the making of china. The only question now is the present classification of residuum oils, as the present duty on petroleum (120 francs per ton) is prohibitive, but strong pressures are being brought to bear on the government now to have fuel oils classified as fuel, which pays only 1·30 francs per ton.

The Inventors' National Association.

Referring to the organization of the National Association of Inventors and Manufacturers, an outcome of the recent patent centennial celebration, the *Electrical Review* thinks every inventor should take a hand in this matter. The immediate work to which the organization should address its energies should be, first, to cover with its membership every inventor of note in the country, and their concentrated effort should be directed upon Congress to relieve the present congestion in the Patent Office. The Interior Department and Land Office, which have pushed themselves into the building paid for out of the patent fund for the use of the Patent Office, should be ignominiously bounced and Congress should be made to provide them with quarters elsewhere.

While these squatters are grandly occupying the larger part of the building with one desk to two rooms, the Patent Office is literary killing its corps by filling each room with from six to ten clerks and the necessary office paraphernalia. A large amount of sickness and a number of deaths are directly attributable to this cause. All this is hard on the inventor. His cases lie in the examiners' rooms awaiting action. A reduced and insufficient complement of examiners prevents early examinations, danger is invited of rival applications being filed and of expensive interference contests arising.

The association will find work to do in combating a growing opposition to patents among farmers; it is perfectly clear that those offering such opposition do not know on which side their bread is buttered. As was well said by several of the distinguished speakers at Washington recently, there is no other factor of our great national prosperity so large as the fruits of invention. An important object to be attained is the establishment of more liberal international patent laws. We are gradually drifting toward that, but this association can expedite matters by showing the State Department what is needed and how to get it.

RECENTLY PATENTED INVENTIONS.

Engineering.

BOILER FEEDER AND METER.—John E. Winder, Pacific, Mo. This invention relates to boiler feeders heretofore patented by the same inventor. A water receptacle containing a float is connected with the boiler, a steam chest being connected with the receptacle and with the boiler, there being a valve in the steam chest. The entire amount of water taken into the receptacle is indicated on a register or meter, the device being simple and durable in construction and automatic in operation.

Railway Appliances.

CAR COUPLING. — David Altman, Macon, Ga. This is an improvement on a former patented invention of the same inventor, and provides a coupling which is simple and easy of operation, and by which the cars can be coupled and uncoupled without requiring the trainman to go between them. The drawhead has the usual flaring mouth, and is provided with a coupling pin opening in its top, adjacent to which are guide frames to retain levers extending to both sides of the car and adapted to properly manipulate the pin.

RAILWAY SIGNALING APPARATUS.—John D. Taylor, Piketon, Ohio. Two patents have been granted this inventor, one of which covers an improvement on his previous patent, and provides for the transmission of signals with certainty and accuracy. It consists in the combination of a polarized relay for receiving the signal from the main line and operating the local circuit and electrically-operated signal receiving and transmitting devices. The other invention is designed to place the control of trains on any system of blocks in the hands of one man, who will have an efficient means of knowing the exact location of all trains, and will consequently know just what signals to give to following trains. The current for operating the system is furnished from a battery or dynamo at the block dispatcher's office, and the intermediate and terminal stations are provided with distinctive sets of apparatus. The danger system is automatically set, and cannot be changed except by the block dispatches, the system being designed to obviate errors by incompetent operators and reduce the cost of operating the block signaling system.

Electrical.

CURRENT REGULATOR. — Joseph A. Williams, Cleveland, Ohio. This is a device for attachment to dynamos, to regulate the current by moving the brushes toward or away from the neutral line. A compound thermostatic bar is combined with the circuit wires of a dynamo, and a pair of compound thermostatic bars are oppositely arranged with respect to each other, and connected with the movable brush-holding bar, while current-shifting devices are arranged to throw the current into one or the other of the secondary compound thermostatic bars.

THERMOSTAT. — Jesse C. Sims, Maynard, Mass. A mercury thermometer tube of the usual description has oppositely arranged lateral branch tubes in which are sealed platinum wires, which touch the mercury as it rises in the tube. On opposite sides of the thermometer are rods carrying sliding metallic blocks adapted to be clamped in a desired position, the blocks having holes and binding screws for connection with wires. The blocks are set opposite and near the point on the thermometer scale at which it is desired to sound an alarm or close a circuit, and wires from the blocks are connected with the alarm it is desired to operate, when, on the rising of the mercury in the tube to form a contact with the wires, the circuit is closed and the alarm is sounded. To indicate a falling temperature the apparatus is placed on a closed circuit, the falling mercury then breaking the circuit and sounding the alarm.

Mechanical.

AUGER. — William Brede and Leon A. De la Nux, Paauhau Mill, Hamakua, Hawaii. This is a tool in which the cutters are detachably attached to the web of the shank in such a manner as to be expeditiously and conveniently applied and removed, the cutters defining the hole to be cut and preventing the web upon entering the wood from tearing its upper surface. The web has dovetail tapering recesses in its edges, at each side of which are downwardly tapering spurs, the cutters fitting in the recesses and a pin passed through the cutters and the web.

STOVE PIPE FITTING TOOL. — Elliott D. Fisher, Franklinville, N. Y. This is a tool for expanding one end of a stove pipe joint and correspondingly contracting the end of a similar pipe joint to adapt them for a sliding connection. It is a compact and simple implement with a hollow conical body having an annular slightly sloping shoulder formed on it near its center of length, an inward curvature produced on the edge of its small end and a flaring mouth on its larger end.

BELT COUPLING.—William P. White, Voluntown, Conn. This coupling consists of two outwardly bent coupling pieces having interlocking hooks and eyes with transverse slots, clamps entering the concave portions of the coupling pieces and having projecting hooks adapted to extend through the slots of the coupling pieces. The device forms a simple and durable coupling of metal, designed to be quickly and easily applied, fastening the ends of the belt so they are not liable to tear, while the united portions will run smoothly over the pulley.

BRICK PRESS. — John P. Alston, Renovo, Pa. This press has a vertical steam cylinder in the upper end of its frame, the piston operating a plunger, below which is supported a mould, in the bottom of which is a plunger supported by a crosshead, the plungers being so connected that on the raising of the upper plunger the lower plunger will rise to expel the brick, which are removed by an equal and steady pressure so that they will not be injured. The operation is automatic, and the frame is mounted on wheels so that it may be conveniently moved about as desired according to the location of the material and the supply of the motive agent.

DIE FOR BUTTON MACHINES. — Leo Prange, Brooklyn, N. Y. This die is formed by breaking a piece of hard metal into two parts, the broken surface of each part constituting the face of the die, the grain of the fractured surface forming a stipple into which ornaments are sunken, the dies being especially adapted for pressing glass or jet buttons.

MECHANICAL MOVEMENT. — Jesse Morningstar, Archbold, Ohio. According to this invention, a circular strap is held on a cam wheel adapted to be driven and provided with trunnions, a shaft with a forked end being engaged by the trunnions, and the shaft being adapted to carry a crank arm to connect with the device to be driven. The device is simple in construction and designed for effective use on various machines, especially for converting the rotary motion of the main driving shaft of a mower into a reciprocating motion to actuate the knives.

Miscellaneous.

SLATE ATTACHMENT.—Maud Wyman, Oakland, Cal. This is an appliance for assisting pupils in learning to write or draw letters, figures, etc. It consists of a box containing a slate, above and beneath which at the upper and lower sides are journaled parallel shafts carrying endless bands, upon which the letters or figures are displayed. Means are provided for actuating the bands to expose such letters, etc., so that they may be copied upon the slate.

WAISTBAND. — A novel waistband designed to connect pants and shirt waists with a yielding connection has been patented by Mr. Frederick Spitz, of New York City. In this invention the band is provided with a series of eyelets arranged in pairs one above the other, with loops of cord extending through the eyelets and secured to the face of the band, by a loop formed of the material of the band. On the portion of the cord loop projecting inside the band is placed a metallic slide to regulate the length of the portion of the loop which receives the button of the shirt waist. This waistband is principally designed for use on children's clothing, but it may be applied with equal advantage to sporting suits.

FISH PRESERVE DAM. — Samuel McElroy, Brooklyn, N. Y. This invention provides an improved dam specially designed for streams and ponds containing game fish, permitting the free discharge of the ordinary and extraordinary stream and storm flow without allowing the fish to escape. Combined with the ordinary weir is an auxiliary weir of novel construction, with screens, on the up stream side of the dam, alongside the ordinary weir, and adapted to discharge into it, the auxiliary weir forming a sufficient outlet for any surplus water, while the fish are retained.

RECOVERING VAPORIZED SOLVENTS. —James R. Whiting, New York City, and William A. Lawrence, Waterville, N. Y. This invention covers an improved method of extracting the active principles and valuable contents of hops by bringing the hops in contact with petroleum, ether, etc., as practiced under a former patented invention of the same inventors. The invention provides for the more rapid and complete recovery of the vaporized solvents in the extractor among the hops after the solvents containing the extract have been drawn off, accomplishing this object by the use of steam, while the steam is at all times kept from contact with the hops.

WELL DRILL APPLIANCE. — Edmund R. Bristol, Jordan, Minn. This is a device for removing broken piston rods from wells. A tube is adapted to be passed into the well having a head on its lower end with a central opening less in diameter on the top than on the bottom, the head passing with its central opening on the end of the broken piston rod, while a tool slides in the tube and has a wedge on its lower end adapted to pass into the head to wedge past the broken end of the rod. The device is of simple construction and designed to be durable and efficient.

LAMP. — Frederick S. Dellenbaugh, Mount Vernon, N. Y. This is a device for the burning of a solid substance, as a stick of paraffine, with a wick, to afford an absolutely safe lamp for use at sea, on railways, or in the household, while being clean and giving a brilliant light. The lamp may be of any desired size or shape, but in its body is held the burner tube with slots through which melted paraffine is passed to the wick, the tube being fitted with a lifter which constantly forces the stick of paraffine up against a stop.

FOUNTAIN INKSTAND. — Charles W. Rohrkaste, Beaver Falls, Pa. This device has a casing in which is an ink well, a funnel sliding down into the ink well through a top opening in the casing, while a flexible cylinder is secured to the well and to the casing. The air is confined in the ink well, and when one presses on the funnel, the pressure of the air on the ink causes the latter to rise into the flaring mouth of the funnel. This inkstand can be readily taken apart for filling and cleaning.

FIRE PROTECTOR. — Willie F. Bean and Frederick W. Dunnell, Springfield, and George B. Noyes, Lawrence, Mass. This invention provides a curtain of asbestos or other suitable material, attached to a spring-actuated roller above a window of a building, whereby the curtain may be quickly drawn over the window as a protection from fire in an adjoining building. The curtain is also designed to be moved in a frame, so that it may be operated from the outside of the building if desired, in connection with a life-saving car.

DOOR SPRING. — Charles W. Harvey, Los Angeles, Cal., and Charles J. Root, Bristol, Conn. The bracket or support of this device has a vertical socket, and a drum with a ribbon or the like, with an actuating spring, while the spring shaft is extended beyond the head of the drum, such extension fitting in the vertical socket. The device is very simple and inexpensive, while it can be easily adjusted to suit right or left hand doors, and the tension of the spring can be readily increased or diminished.

DOOR CHECK.—Herman A. J. Rieckert, New York City. By this invention toggle levers are adapted to be supported on the door casing and press on the door, a spring formed by a hollow ball of flexible material being connected with a joint of the toggle levers. The device is very simple and durable in construction, and adapted for use on doors mounted to swing in both directions, serving to retain the door in a closed position and prevent it from swinging forward beyond the normal position when opened in either direction.

UMBRELLA HOLDER.—Joseph C. Garrott, Brooklyn, N. Y. This is a stand designed more especially for holding umbrellas in stores or shops when on exhibition or sale, allowing quite full examination of them without unnecessary handling, and so that they present an attractive appearance to buyer and seller and are locked safely against theft. In each end of a suitable base, preferably of ornamentally moulded wood, is screwed a post, which may be a metal tube, and these posts give support to bent wire end parts adapted to hold two series of crossed umbrellas at each side of another series of central upright umbrellas.

BOOT BLACKING BRUSH. — Robert L. Stevens, Ward, Pa. This is a machine for polishing boots by the wearer without stooping over. A pair of horizontal rock shafts are journaled beneath a foot rest near the bottom of a vertical frame, the rock shafts carrying brushes on opposite sides of the foot rest, while a hand lever extends upward from each rock shaft. The boot or shoe, having been daubed with blacking, is placed on the foot rest, when the hand lever is reciprocated, rocking the shafts and reciprocating the brushes along the foot rest, thereby cleaning or polishing the boot or shoe.

ICE CREEPER.—Rollin A. Camp, Saginaw, Mich. This is a device to prevent pedestrians from slipping on ice or frozen surfaces. It consists of a plate formed in sections, one section being slotted and having a flange and the other having a cam, while each section has a series of apertures and a spur, the spur of one section projecting through the apertures of the other section. The device is simple and inexpensive, and can be readily put on or taken off the boot or shoe, or applied over a rubber or other overshoe.

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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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(2996) J. B. S. writes: SCIENTIFIC AMERICAN SUPPLEMENT, No. 779, page 12444, central column, about 2 inches from the bottom: "This lamp has no chimney and burns ordinary paraffine oil with a blue flame like a Bunsen gas jet." Be kind enough to describe the lamp or burner producing the blue flame. A. This burner is an atomizer similar to those used for spraying perfumery, medicine, etc. You will find it described on page 101 of "Experimental Science."

(2997) R. M. W. asks: How can tortoise shell be polished? A. After the tortoise shell is scraped smooth with a piece of glass, rub it with fine sand paper or Dutch rushes; repeat the rubbing with a bit of felt dipped in very finely powdered charcoal, and, lastly, apply rotten stone or putty powder, and finish with a piece of chamois skin damped with a little sweet oil, or still better, rub it with subnitrate of bismuth applied by the palm of the hand.

(2998) W. D. F. asks: How can I test drinking water for the presence of lead? A. Test by acidulating the water with hydrochloric acid and running hydrogen sulphide gas through it; this is preferable, but if the gas cannot be readily made, hydrogen sulphide water will answer. If sufficient lead be present, a black precipitate will be formed. Lead pipes in time become covered with a coating which prevents the water from coming in contact with the metal.

(2999) H. E. asks: Which are the three largest navies in the world at present? A. English, French, Russian.

(3000) J. W. W. asks: How can graphite rod be soldered or fastened to copper wire, or what kind of solder is necessary, and is there such a solder as copper solder? A. You can cast lead around the end of your graphite rod, or you can copper the rod by the galvanic method. The wire can be soldered to the lead or copper by means of soft solder or by the galvanic method, in which case copper is the solder.

(3001) J. S.—Loof or loofah is the name of the fruit of *Luffa Ægyptiaca*, a plant belonging to the order Cucurbitaceæ, which includes the pumpkin, squash, cucumber, the various kinds of melons, etc. The fruit is fibrous and netted within and is cut up when dry and used as a flesh rubber in Turkish baths. Hence the fruit has been called the towel gourd. The fibrous substance of the fruit is also used for washing dishes.

and has therefore been named the vegetable dish cloth. The plants belonging to the genus *Luffa* are natives of tropical Asia and Africa.

(3002) G. H. L. asks: 1. What is the inclosed powder, and what is it worth per pound? A. Potassium nitrate, worth 10 to 12 cents a pound in small quantities. 2. What is chromic acid worth per pound, and why is it not more generally used in batteries instead of electropoion fluid? A. 40 cents a pound. It is often used with water and sulphuric acid for batteries. Alone it is not a substitute for electropoion fluid. 3. The formula for electropoion fluid as generally used is five parts of a saturated solution of potass. bichromate and one part sulphuric acid. Now, as the formula for producing chromic acid is 100 parts saturated solution potass. bichromate and 150 parts sulphuric acid, and as the end sought for is the liberation of chromic acid, it would seem to me that not enough sulphuric acid is used to secure economic working. Am I right? A. Working on the basis of saturated solutions is misleading. For electropoion fluid a good formula—and there are a number—is the following: Mix one gallon sulphuric acid with three gallons of water. In a separate vessel dissolve 6 pounds of bichromate of potash in 2 gallons of boiling water, then mix the two solutions carefully. Use when cold. You misapprehend the object of the sulphuric acid. It not only has to set free chromic acid, but has to supply the acid radical to combine with the chromium, and forming with the potassium sulphate chrome alum, and with zinc, zinc sulphate. 4. I have twice tried a battery, using electropoion fluid with sodium bichrom. in porous cup and sal-ammoniac in outer jar, and both times, after the cell had been set up two days, the porous cup would burst, bluish crystals forming in the pores. Why is it? A. It is hard to assign the exact cause from your description. As the combination is a bad one you should avoid it, and use sulphuric acid diluted with water in the outer cell.

(3003) F. G. S. asks (1) a simple way of testing milk so as to find out whether it has been adulterated with water, etc. A. There is no simple way that is reliable. The lactometer (a specially graduated hydrometer) gives some clew and is extensively used. See SUPPLEMENT, Nos. 71 and 292. There are also color or transparency tests. 2. Also a simple process for recutting files with acid. A. Clean with hot lye, benzine or turpentine and wash in warm water. Immerse in a jar containing 1 volume each of nitric and sulphuric acids and 2 volumes of water. The files should be put in toe downward for an hour or more. Wash finally. For sand blast sharpening see our SUPPLEMENT, No. 416. 3. In making permanent magnets is it best to temper the steel as hard as possible? A. No. Draw to a straw color.

(3004) D. B.—Red marking ink unaffected by soap alkalies is made as follows: Enough finely powdered cinnabar to form a moderately thick liquid is very intimately mixed with egg albumen previously diluted with an equal bulk of water, and beaten to a froth and filtered through fine linen. Marks are formed on cloth with this liquid by means of a quill and are fixed after they have become dry by pressing on the reverse side with a hot iron. This might work in a rubber stamp by adding glycerine, but we recommend you to use the quill.

(3005) Mrs. E. C. H.—The glistening substance in the sand is finely pulverized mica. The so-called star of Bethlehem may have been a sudden outburst by collision of two stars. The outbursts of star light at various times since have been called stars of Bethlehem. They were accidental and without regularity of time and duration. They may appear at any time, but have nothing to do with the brilliant glows of the planet Venus.

(3006) A. G. L. asks how to copper-plate on the surface of plaster of Paris, the copper plate to be about an 8th or 16th of an inch thick. A. Coat with graphite rubbed on with a brush. Dust on some iron dust or very fine filings and pour some sulphate of copper solution over it. Then proceed to plate. The thickness seems excessive.

(3007) J. H. R. asks whether there is any difference between platina and platinum. A. There is no difference: the last, "platinum," is the best usage.

(3008) I. M. T. asks how to ink a type-writer ribbon with the ink used with the copying pad described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 438. A. Rub the ink on the ribbon with a stiff brush. For type-writer inks we refer you to the SCIENTIFIC AMERICAN, No. 21, vol. 59.

(3009) W. R. asks for a good harness dressing. A. ¼ ounce isinglass, ¼ ounce indigo, 4 ounces logwood, 2 ounces soft soap, 4 ounces best glue and 20 ounces vinegar. The whole is warmed, mixed, strained, and allowed to cool.

(3010) P. J. M.—Our navy ranks at present among the smallest, but the people have expectations of improvement.

(3011) C. S. asks: 1. Where can I get rubber (like the one inclosed) one foot square, or more? Address the New York Rubber Belting and Packing Company of this city. 2. How can it be fastened to cloth? A. It cannot be satisfactorily secured. 3. Will the cloth, attached to rubber, shrink, if kept always in water? A. Not to any great extent. If completely embedded in India rubber, the shrinkage will be still less. 4. What kind of cloth should be used? A. Cotton drilling or sheeting will answer. 5. Is cloth made waterproof in any other way, that is just as durable as the above mentioned, where the cloth is folded and brought apart every five minutes or so? A. No. 6. Is there any metal, and what kind, that won't rust if kept in water (being in frictional contact with another surface)? A. Platinum, also, within measurable limits, bronze, brass, aluminum bronze, and Babbitt metal. 7. Where it can be done, what sub-tance should be used for covering, and how to protect metal where it is under water? A. Apply japanning baked on. The method of applying a rubber coating to cloth is quite complicated. It is described in "Rubber Hand Stamps and the Manipulation of India Rubber," $1, by mail.

(3012) J. F. C. asks: 1. What is the composition of the alkali found in the soil of western lands? A. The composition varies. An efflorescence from near Humboldt Lake, Nevada, contained:

Salt	49·67
Sulphate of sodium	20·88
Sesquicarbonate of sodium	18·15
Borate of sodium	11·30

2. What is a simple and reliable test for the same? A. No fixed test can be given. 3. Where can I find a full description of the storage battery, with explanation of its action? A. See our SUPPLEMENT, Nos. 338, 314, 342, 416, 517, 722.

(3013) G. F. K. asks: What are the chemicals used as a precipitate to determine the deposits in the water of an artesian well for boiler purposes? A. Clear lime water will precipitate any bicarbonate of lime that may be in solution. Alcohol added in large quantity, say in equal volume, will precipitate sulphate of lime. Care must be taken in executing the first test, as lime water in the air rapidly becomes clouded. The vessel in which the precipitation is effected should be covered immediately after the addition of lime water. If a test tube, the thumb may be placed over it and the whole may be shaken.

(3014) J. P. B. writes: In your paper of the 18th April, 1891, I noticed a communication from George M. Turner, regarding his mode of cutting off the bottom of a bottle. The most satisfactory and simple way I have ever tried is as follows: Having selected a small but well twisted cotton string, and saturated it in kerosene, turpentine, or some other oil, I tie it in two strands hard knot around the bottle where I desire to make the cut. This done, and after wiping off the excess of oil that may ooze out on the bottle, I set fire to the string, carefully and slowly rotating the bottle, in order that the flame may creep around. Then, when the oil has burned out, I trace around the bottle with a small brush wet (not dripping) in water. In nine times out of ten a successful cut can be made. Care should be taken, however, to have the bottle uncorked, and in no case have it contain moisture, these precautions being necessary to prevent explosion.

(3015) C. B. N. asks: 1. What is the chemical that is used to oxidize carbon in batteries in which the carbon takes the place of the zinc in ordinary galvanic batteries? What is the composition of same? A. The Jablochkoff battery has a negative plate of cast iron, positive of carbon, with fused sodium nitrate as the electrolyte. 2. What is the latest theory in regard to what the process was by which the ancients used to harden or temper copper? A. It is we believe still unknown.

(3016) W. S. M. writes: In your SCIENTIFIC AMERICAN of January 10, 1891, on page 21, under the subject "Improved Lamps Greatly Needed," I would inquire what kind of gas is it that is generated in the wick of a lamp tube? A. The gas is a heavy hydrocarbon, easily condensible and inflammable in the air, and if mixed with the right proportion of air, it is explosive. Such proportion however must be nearly exact.

(3017) A. B. C. asks for a receipt for making a good liquid dentifrice. A. Carbonate of potash ½ ounce, honey 4 ounces, alcohol 2 ounces, water 10 ounces, oil of wintergreen and oil of rose enough to suit the taste. Color with cochineal if desired.

(3018) C. A. W. asks: By what solvent can I obtain a pure solution of ichthyol up to 5 per cent? A. Use water or alcohol.

(3019) R. W. R. writes: 1. What other moulding material is used in manufacturing rubber stamps besides plaster of Paris and stereo process? A. Flong and oxychloride of zinc matrices may be used for rubber stamps. We refer you to "Rubber Hand Stamps and the Manipulation of India Rubber" $1 by mail. 2. Also what is used to soften silex, I mean prepared silex, such as dentists use to cement porcelain teeth? A. Treatment with muriatic acid might effect this. It is removed from teeth by mechanical treatment.

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April 28, 1891.

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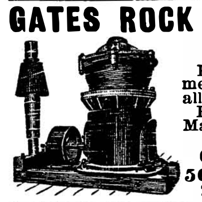

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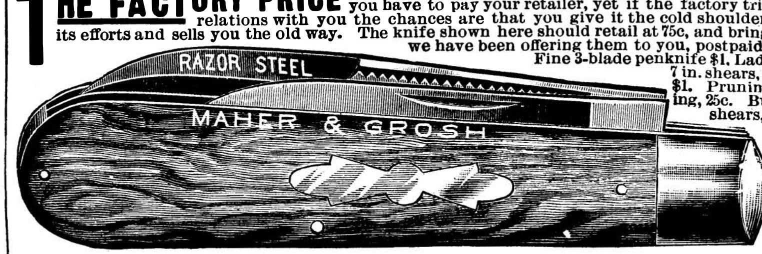

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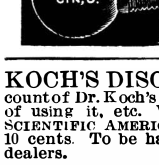

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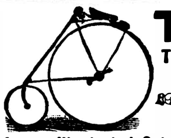

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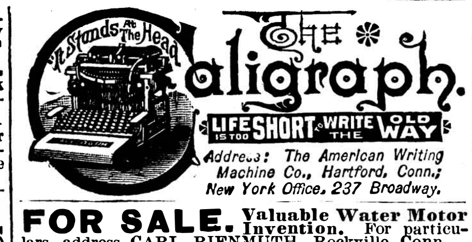

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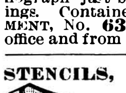

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