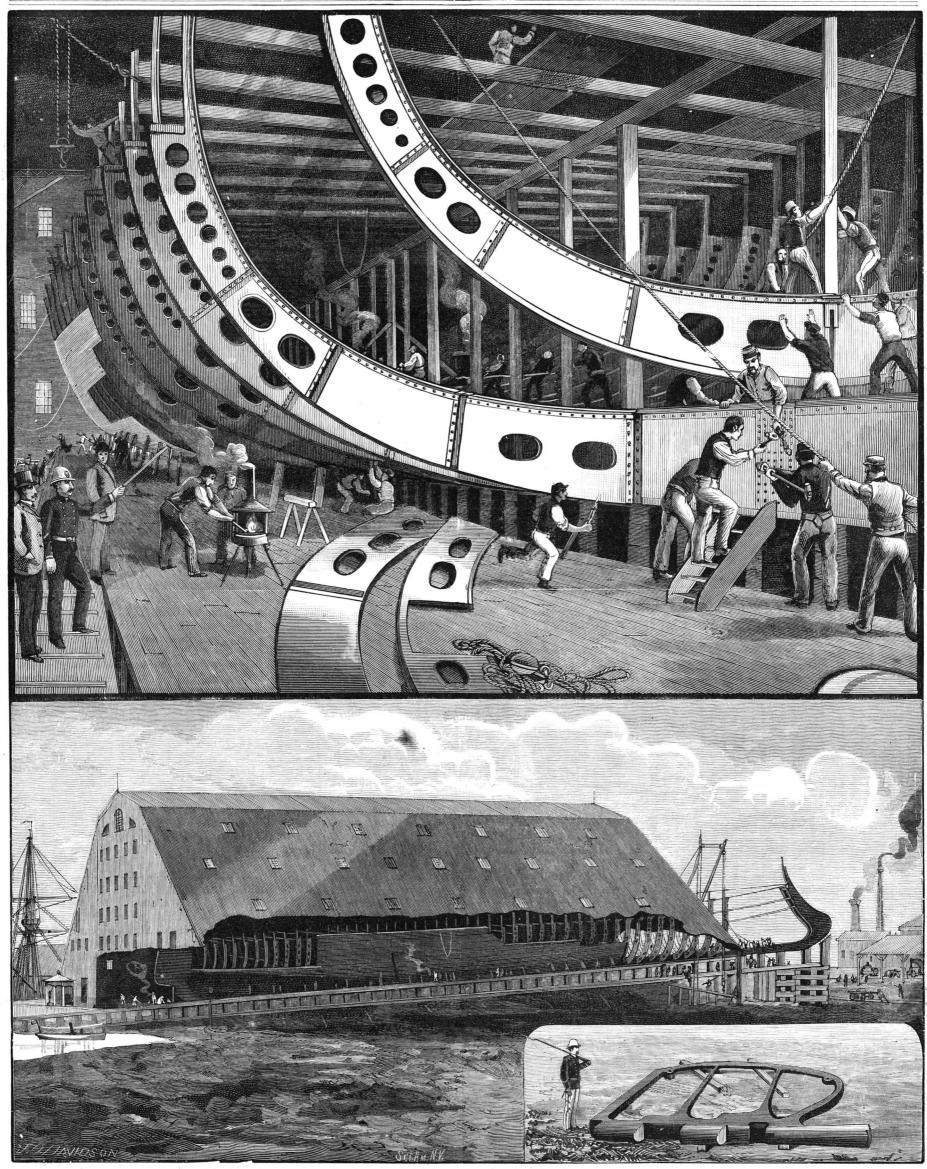
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXI.—No. 14. ESTABLISHED 1845. NEW YORK, OCTOBER 5, 1889.

\$3.00 A YEAR.
WEEKLY.



CONSTRUCTION OF THE NEW WAR SHIP MAINE, AT THE BROOKLYN NAVY YARD, NEW YORK.—[See page 212.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S or Canada \$3	00
One copy, six months, for the U. S or Canada 1	50
One copy, one year, to any foreign country belonging to Postal Union, 4	00
Remit by postal or express money order.	

Australia and New Zealand.-Those who desire to receive the SCIENTIFIC AMERICAN, for a little over one year, may remit £1 in current Colonial bank notes. Address

MUNN & CO., 361 Broadway, corner of Franklin Street, New York

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size WITH SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, for U. S. and Canada. \$6.00 a year to foreign countries belong ing to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.-The Scientific American and Supplement will be sent for one year, to any address in U. S. or Canada, on receipt of seven dollars.

The safest way to remit is by draft, postal order, express money order, or

registered letter. Australia and New Zealand .- The Scientific American and Supplement will be sent for a little over one year on receipt of $\pounds 2$ cur-

rent Colonial bank notes. Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York

NEW YORK, SATURDAY, OCTOBER 5, 1889.

(Illustrated articles are marked with an asterisk.)

Alarm, high and low water,	Lamp, improved, Bissell's* 2
Streeper's* 211	Light, white, developing by 2
Appliances, railway	Linen, photographing on 2
Ass., Am. Pub. Health 208	Machine, printing, web*
Business and personal	Maine, armored cruiser, build-
Capital, no longer English, but	ing*207, 2
American 214	Mines, nickel and copper, at Sud-
Cook, Prof. Geo. H	
Court on board Cooking 911	bury, Ontario 2
Cutter, band, Cook's* 211	Mount Stephen* 2
Damage by water in Peru 209	Notes and queries 2
Donkin, Mr., fate of 209	Notes, photographic 2
Dynamo. electro-plating* 213	Operator, shutter, Jorres'*210, 2
Engineer, professional and prac-	Railway, Transandine 2
tical	Rifle, magazine, Remington-Lee*2
Enterprise, lumbering 216	Rolls, bending, large 2
Eruption, volcanic, in Turkey 214	Sifter, ash, Crosby's*
Exerciser, hand, Bidwell's* 210	Snake, black, not poisonous 2
Fever, typhoid, prevention 215	Snake, hoop
Galvanometer, tangent 209	Spider, poisonous*
Gas, natural, in Wheeling 209	Sun, eclipse, expedition
Gearing, frictional, Evans'* 210	Surface, porcelain, now to give
Head, pains in 217	paper
Indicator, price, Wands'* 211	Telephones, French, seizure of :
Inventions, agricultural 218	Vine and olive in Algeria
Inventions, engineering 218	Wheel, water, Adams'*211,
Inventions, index of 219	Windows, dark room
Inventions, miscellaneous 218	Workmen, Am., back from
Islands, Seychelles*	
2014040, 20, 0110100	·

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 719.

For the Week Ending October 5, 1889.

Price 10 cents. For sale by all newsdealers.

P	AGE
I. BIOLOGY.—Pasteurization of Fermentable Liquids.—A practical application of biology to the preservation of beer.—The Kuhn ap- paratus illustrated and described.—3 illustrations	11474
II. CHEMISTRY.—Notes on Explosives.—By C. NAPIER HAKE.—A very valuable and important paper treating of the technology of explosives of all kinds, with interesting data and statistics. The Nature of Solutions.—By S. U. PICKERING, M.A.—A newly discovered hydrate of sulphuric acid, tending to prove the existence of hydrates in solution	
III. CIVII. ENGINEERING.—The Mersey Tunnel Railway.—Tunnel- ing of the Mersey at Liverpool.—Statistics of the permanent way and general plant as installed	11464
IV. EDUCATIONAL—Two American Institutions.—The history, origin, and scope of the Smithsonian Institution and the Johns Hopkins University.	11476
V. ELECTRICITY.—A Summary of the Difference between Positive and Negative Electricity.—An interesting summary of this debatable point by M. DECHARME.—An interesting contribution to electrical science. Public Experiments in Electricity.—Interesting trials of the action of the electric discharge through long wires as performed many years ago.—I illustration.	
VI. HOROLOGY.—The Mysterious Watch.—A very curious transparent watch described and illustrated, with suggestions of its application to illuminated clocks.—I illustration.	11475
VII. HYG1ENE.—Poisoning by Cotton dyed with Lead Chromate.— By T. H. Weyl—The poisoning of operators engaged in winding colored yarn.	
VIII. MISCELLANEOUS.—Note on Two Balls of almost Perfect Sphericity recently exhibited in Geneva	11475
IX. ORDNANCE.—The Hiram Maxim Gun.—The famous American invention now to be introduced in the Austrian army.—Illustra- tion of its trial.—I illustration	

tion of its trial.—I illustration.

The Gun.—Progress & Ordnance.—The first installment of a very elaborate and important review of the construction of very heavy artillery, giving many interesting figures.

X. PHOTOGRAPHY.—Colloidal Cellulose.—A very curious modification of cellulose.—Its existence in the gelatinous state, with probability of its application to photography

The Effect of Light on Matter.—By Captain W. DE W. ABNEY.—A British Association paper, giving a review of the present aspect of the photographic field by a leading authority.

XI. PHYSICS.—On M. H. Hertz's Experiments—By M. JOHERET.— XI. PHYSICS.—On M. H. Hertz's Experiments.—By M. JOUBERT. A clear synopsis of these famous experiments on ether wave with deductions drawn therefrom.—2 illustrations......

its occurrence

XIII. TECHNOLOGY.—Esparto.—Esparto grass, its export, method of working, and application to paper making.

Machine for decorticating Ramie.—A machine for treating the plant while green, its hourly production, and general description.

—I illustration.

V. TOPOGRAPHY.—Bull Rock Lighthouse, South Coast of Ireland.—Description of the famous Bull Rock, and an elaborate description of the installation erected near its apex.—Il illustrations.

THE AMERICAN PUBLIC HEALTH ASSOCIATION.

The seventeenth annual meeting of this association is to be held in Brooklyn, N. Y., on October 22d to 25th of the present year. The objects of the association are the advancement of sanitary science and the promotion of organizations and measures for the practical application of public hygiene. At the forthcoming meeting, it has been decided to take a step in advance, and have an exhibition of everything available adapted to the promotion of health. The synopsis of this important and interesting feature includes nine divisions, subdivided into forty classes. The divisions embrace the dwelling, schools and education, clothing, food, sanitary engineering, public health administration, laboratory and "Red Cross" work. It is to be held in the hall on the corner of Fulton and Pineapple Streets, from October 22d to December 1st, and is to be open to the public. The subjects to be considered more particularly at the meeting embrace infant mortality, railway and steamship sanitation, cooking, contagious and epidemic disease, vaccination, and the sanitation of public buildings and institutions. The membership of the association consists of about eight hundred persons, including many prominent physicians and sanitarians. Its object cannot be too highly commended, and the idea of giving a practical interest to the occasion by an exhibition, with the consequent awards of diplomas and medals, is worthy of all praise. There is no reason to doubt that the exhibition will be taken advantage of by many inventors in this line of work, and that the first health exhibition in this vicinity will be the prelude to a long series of what our English neighbors would call "healtheries." America in many ways is in advance of other countries sanitarily. The extensive use of water has made elaborate sanitation a necessity, and much talent has been devoted to the subject here. We shall watch with interest the progress of the exhibition, knowing that American sanitarians and inventors give it the best basis for success.

A. N. Bell, M.D., of Brooklyn, is chairman of the committee on exhibits. J. H. Raymond, M.D., also of Brooklyn, is chairman of the executive committee.

THE PROFESSIONAL AND PRACTICAL ENGINEER.

The correspondence of such a journal as the Scien-TIFIC AMERICAN, one devoted to the scientific life of the world, includes many letters from aspirants to professional life asking for advice. One writer will wish to know what steps to take to learn electrical engineering; another will ask whether a college course is essential to a mechanical engineer; another, holding a position in a shop, will ask whether he should leave it and go to college. Many such queries are confidently referred to the editors of this paper for solution. With the most definite desire to assist such aspirants, specific advice can but rarely be given. The personal element enters so largely into the problem of life, that a confident answer cannot be based on letters alone.

Professional life is generally felt to be something outside of the business circle. Different qualities are supposed to be essential to one or the other vocation. The business man feels himself on a separate level from that of the scientist. The latter, on the other hand, is too apt to wrap himself up in an envelope of self-consciousness, and assume an intrinsic merit, due to his status, that shall supplant his personal defects. But if the real truth is sought, the matter becomes simplified. In nine cases out of ten, both the commercial man and the engineer will be found to possess practically the same qualities. Those attributes which carry success with them in one occupation will do the same in the other. Good strong common sense is the first element. Let this be joined with perseverance, and the same individual will attain his end either in one or the other branch.

It is often sad to hear men, naturally highly qualified, lament their want of education. It is doubly sad, because such want is generally due to themselves. Every one has some free time that can be devoted to study. But knowledge acquired in the regular routine at some scientific school seems to be regarded as the one and only "open sesame." Its want is made the dolence. All over the land in the machine shops and engine rooms are men content to spend their lives in one dull routine, presumably because they were never highly educated. Yet every man could give from two to six hours a day to study. If properly directed, it would directly or indirectly help him on. If not so fully applicable to the struggle of a breadwinner as to entitle him to a higher position, it will at any rate inspire him with the ambition that will force him out of the routine of an unchanging occupation.

The history of this country gives excellent examples of the truth of what is here stated. It is full of instances of men who have attained fame and distinction from pursuing their studies alone and unaided. The self-made and self-educated have done more for America than have all the graduates of her colleges.

A young man who enters a technical school has be fore him three or four years of study of a very severe

in mathematics and literature. If he studies properly and passes his examinations honestly, he will have to work hard. At the end of the term he graduates. The expectations which have been formulated during the terms of study will at first vary for each case. But unless he has influence, the prospects of each graduate will appear identical after a month. With all his education, the engineering world will offer no place for him. As week after week passes, his eagerness to be at work will grow until he is ready to begin a second education by working at anything approaching engineering, for any remuneration or for none at all. Now imagine some young workman fretting about his want of education. In a fit of supposed inspiration he resigns his position to begin a course of study at some school or college. The graduate whom we have pictured above would feel his fortune made if he could step into the discontented workman's place. It is the old story; every one is discontented with his own work, and envies that of others.

The above may read like a disparagement of the benefits of education, but it is not. An educated man will learn more in a shop in a month than an uneducated apprentice will in a year. But education alone, or even the happy combination of education and experience, are not enough to insure success. The well known figures of the percentage of business failures may be cited. Of one hundred business enterprises that are started, it is said that only three succeed. A professional career may safely be considered a business enterprise into which some money and much time has been put as the capital. Very few succeed. The reasons for failure are the same for the professional man as for the merchant. The indefinable quality, usually termed executive ability, is as necessary in one case as in the other. A man who will lead in business, if his attention had been directed to other lines, would have achieved a success in professional life. Energy, perseverance, the art of dropping completely anything that does not conduce to the end in view, the placing of temporal success as the summum bonum of at least one's daily exertions, these are needed as much for financial success in professions as in the merchant's office.

So many young men are now graduating from our technical schools, and the ranks are being so largely recruited from Europe, that college acquirements are rated rather low. After graduation, a term of years of poor remuneration lies before the aspirant for a place in the scientific world. After the struggle seems partly over, some reverse may occur that will put him back to the starting point. Professions have as distinct and as many failures as have business ventures. After a failure or loss of position comes the weary struggle to get back "into the swim." A human life has not time for many such cycles.

Such considerations are not pessimistic, but are the reverse. Instead of looking for a change to be reached by abandoning one's position and going to college, keep the position and make the change in yourself. Study at home in the evenings. Realize the fact that a year of study is nothing, that four or five years will be needed before it will tell. After a year the problem of the applicability of scientific knowledge to your life will be solved, as well as the practicability of obtaining it yourself. If it is in you to work up the ladder, you will find that in nine cases out of ten it is yourself who can supply the essential study and work. After four years, if what is here suggested is honestly and truly done, we believe that in most cases far more advance will have been made than if, abandoning shop work and its rough schooling, a young man enters college, to leave it quite possibly with seeds of fruitless discontent sown in his nature that will last him for life. Every man is his own school teacher, and makes his own education. If he does not succeed without a four years' course in a technical institute, it is his own fault. He must not blame circumstances for a personal failure.

THE NICKEL AND COPPER MINES AT SUDBURY, ONTARIO.

One of the attractions of the recent meeting of the American Association for the Advancement of Science excuse for what is little better than downright in- at Toronto was the excursion immediately after the meeting to the region of Huronian rocks north of the Georgian Bay, under the direction of Drs. Selwyn and Bell, of the Canadian Geological Survey; and one of the most interesting features of the excursion was some hours spent at the Stobie and Copper Cliff mines, which are worked by the Canadian Copper Co., and at the Murray mine, which belongs to an English company. These mines are near Sudbury, which is about 300 miles west of Ottawa on the main line of the Canadian Pacific Railway.

The mines of this region are all new. Indeed, it was the building of the Canadian Pacific Railway only a few years ago that revealed the presence of nickel and copper ores in paying quantities. The ore is massive pyrrhotite (magnetic iron pyrites), carrying from 2.5 to 6 per cent of nickel, and associated with considerable chalcopyrite (copper pyrites). Traces of platinum and other rare metals have been detected, while gold high dip toward the northwest, and extend in a rather niles from Sudbury, northwestward to an undetermined distance beyond Sudbury.

Through the courtesy of the Canadian Copper Co. special engines were placed at the command of the geologists, and with Dr. Peters, the able superintendent of the mines, as a guide, the Stobie mine was visited first. This mine is worked as an open quarry, with shallow adits into the side of the hill. The ore is low grade, running only 2.5 per cent of nickel and the same of copper, and is not smelted by itself, but is used as a flux for the ore from the Copper Cliff and another nine belonging to the same company, which carries considerable silica. The Stobie mine was opened itself into the Rimac a little way below, but in no three years ago, but not much work was done at it for

The principal mine of the company is the Copper Cliff, located about four miles southwest of Sudbury on the Algoma branch. It was opened in 1886, and was first worked as a quarry in the face of a cliff; but now mining is confined to a shaft which pierces the 500 ft. The ore is high grade, carrying 4 to 6 per cent of nickel and 6 to 9 per cent of copper, but the abun-Stobie ore, rich in iron, as a flux.

The most modern methods of reduction are employed. The ore is roasted in the open air in great heaps, each containing 1,000 tons of broken and crushed ore. These piles are ignited by means of wood, which burns 600,000 soles, or \$420,000. for about 24 hours, raising the sulphides to the temperature of ignition, when the sulphur in them maintains the combustion for two months. From the roasting heap the material goes to the smelters, which are lage is a deep cut terminating in a narrow valley water-jacketed cupola furnaces with forced draught. There are two of these smelters at work, one of which usually dry had been carefully prepared for flood by has been in operation without break since early in enlarging it and paving the bottom near the railroad January, while the other has but just been finished with heavy smooth stones, to facilitate the passage of and started. Each has a capacity of 100 tons of ore in stones and other materials brought down in time of 24 hours.

The matte produced by these furnaces varies in the smelter again. Nothing more than this crude reis shipped to England, though some of it finds its way railroad. into the hands of Joseph Wharton, the nickel king of the United States.

square miles of mining country, and will undoubtedly of from ten to twenty feet. Some of these stones become one of the greatest mining companies in the weighed several tons, and could not be removed by and Plate Mill have been very greatly bothered by Evans, besides those just described. The efficient chemist of this company, Mr. F. L. Sperry, was the fortunate discoverer of the interesting new mineral wonder where Nature found the material for working sperrylite, PtAs₂, in the screenings from the Vermilion this ruin. gold mines, 22 miles west from Sudbury, on the Algoma branch. This new arsenide was described in full by Professors Wells and Penfield in the American Journal of Science for January, 1889.

The Murray mine lies a mile and a half northwest from Sudbury on the main line of the Canadian Pacific. out is intermediate in richness between that from the done as follows: Stobie and that from the Copper Cliff mines. An interesting fact in connection with this mine is that this region.

it is the Dominion Copper Co., which is doing preliminary work five miles north of Sudbury.

E. O. HOVEY.

DAMAGE BY WATER IN PERU.

Oroya railroad, famous as one of the most remarkable their reports till the next day. pieces of engineering in the world, has furnished frequent examples of this power.

From the sea level at Callao it climbs to an elevation of over twelve thousand feet at Chicla, a distance by the road itself of eighty-six miles.

Crossing as it does deep valleys and clinging to the sides of lofty mountains, it was in its conception a challenge to the forces of nature, and has frequently been called upon to withstand their wrath. The last graphs in office, and to warn the office employes that rainy season caused more serious damage than ever before experienced

Traffic above San Bartolome has been suspended for some months, and aside from complications with the government which have prevented any great outlay, the bridges cannot be restored for many months.

On March 21, in search of a suitable site for an observing station for Harvard College observatory, I force."

Algoma branch of the Canadian Pacific, southwest of rode on mule back past the Verrugas viaduct, said by Sudbury. The sulphides seem to impregnate some- the Peruvian press to be the finest in the world. Howwhat lenticular beds of diorite. These beds have a ever this may be, it certainly was a magnificent structure, spanning one of the deep "quebradas" so comrregular line from Victoria on the North Channel, 65 mon among the foothills of the Western Andes. It was situated at an altitude of 5,836 feet above sea level and was 575 feet in length, and supported by three iron columns, the center one of which was 252 feet high. These columns rested on solid foundations of masonry, so constructed as to withstand any ordinary flood. Looking up to it from below, it seemed impregnable, so much so that a few days later at Matucana, on my way back from Chicla, when news came that the Verrugas viaduct had been washed away, no one would believe it.

The next day I passed the place again. As on my way up, there was only a trickling stream emptying other respect did the valley present the same appearance. For half a mile below the bridges were masses of debris, huge bowlders and pieces of iron brought down by the water.

The Verrugas valley, although narrow, extends back an immense distance into the foothills of the Andes, and receives the rainfall on vast slopes that rise to the bed at an angle of 45°, and has reached a depth of height of 10,000 feet. At this time there was a tremendous fall of rain, or "cloud burst," and in a few minutes, in place of a petty stream, there was a broad. dance of siliceous gangue necessitates the use of the deep torrent bearing down the steep valley immense bowlders. Without doubt it was these masses of rock, thrown with such force against the central column. that accomplished the destruction of this bridge, made by the Baltimore Bridge Company at a cost of about

On June 15, in the company of Mr. R. B. Hubbell, superintendent of the railroad, I visited San Bartolome, where extensive repairs were going on. Near this vilcrossed by a small iron bridge. The bed of a stream flood. This stream crosses the railroad at right angles. An eye witness of the event, who was obliged to run richness from that which carries 15 per cent of nickel for his life, says that the fall of water was so sudden and 25 per cent of copper to that which contains more that the descending mass presented a solid wave front than 20 per cent of nickel and 30 per cent of copper. twenty or more feet high. In five minutes the bridge Matte below the minimum just given is put through was carried away and the natural outlet of the stream was blocked with stones and mud and the torrent duction is attempted at the mine. Most of the matte turned through the deep cut along the track of the

In spite of this abrupt change of direction, within an hour the cut was filled for a distance of several The company operating these mines owns about ten | hundred feet with a mass of stones and mud to a depth world, though as yet it has opened but one mine, the derricks without blasting. One who has seen the steep sides of these rocky valleys full of great bowlders barely waiting some force to remove them, will not was especially the case recently, and the company is S. I. BAILEY.

Chosica, Peru, July 25, 1889.

Seizure of the French Telephones.

An incident recently took place in Paris which well illustrates the real nature of the so-called republican government of France. On that day, being on the eve Work at it was begun only last June, but it bids fair of the elections, the government took possession of the to become a very valuable property. The ore taken telephone lines in the most arbitrary manner. It was

At 10 o'clock twelve engineers or sub-engineers, designated by M. Cael, directing engineer of the district of is the locality at which a cutting by the railroad first Paris, each accompanied by a police commissary, prerevealed the fact that there was valuable ore in the sented themselves at the twelve Parisian telephonic offices. In each of these offices they were received by But one other company is operating in this vicinity; a manager or high official of the General Telephone graphic views of mountain heights which are now on Company, assisted by a sheriff's officer.

The government hoped, by proceeding on a Sunday to these various violations of domicile, to avoid the boldest of these mountain photographers was Mr. legal reports of the ministerial officers; but, thanks to Donkin. His views of the Alps are famous, and he set an ordinance of the President of the Tribunal of Com- out a year ago to duplicate his achievements with the The tremendous power of water, shown by the re- merce, the sheriff's officers required were authorized to camera in the monarchs of the Caucasus. In ascendcent disasters in the United States and elsewhere, work Sunday. These officers limited them selves, how-ling Mount Dychtan, however, the adventurous phofinds ample illustration also in this country. The ever, to verifying the facts. They could not draw up tographer fell a martyr to his enterprise. For a long

telephone company, the police commissary read the ministerial warrant of August 30, consecrating the seizing, and ordering the taking possession of the premises | Dent, the president of the British Alpine Club, climbed belonging to the telephone company. After this reading the police commissary informed the representatives of the company that he had received orders to place the engineer of the Administration of Posts and Teleit was this new functionary they had henceforth to obey. It was M. Clement who arrived at the Avenue de l'Opera agency.

"Do you give way before the ministerial warrant I have read to you?" asked M. Clement of M. Lair.

"Not at all," answered the chairman of directors of the telephone company. "We shall only yield to

M. Clement hereupon informed M. Lair that the ministerial warrant empowered him to use force. "In that case," said M. Lair. "I give way; but you will recognize in your report that I have only yielded to force. You will also tack on to this report the written protest which I hand you in the name of the com-

A very amusing incident marked the seizure of the telephone office in the Avenue de l'Opera. The artist of an illustrated journal was sketching the scene in the office, when M. Clement went up to him, took his paper from him, and forbade him to sketch the scene. The seizure of the departmental offices was gone through with the same formalities and the same pro-

The "Hoop Snake"-the Black Snake not Poisonous.

The Scientific American has been requested to answer the following questions: "Is there such a thing as a 'hoop snake,' and has anybody ever seen one, or a specimen of one?" The way the "hoop snake" is said to move about is thus: It takes its tail in its mouth, coils itself in an ellipse, and moves around like a hoop. "If there is such a thing, where can I see a specimen, or in what work is it described?"

There are many persons who uphold the existence of the "hoop snake," yet all reports and declarations that have been advanced in its favor have all proved to be totally unreliable. The anatomy of a snake alone is sufficient to prove that hoop-like progression is impossible. The hoop snake has never been described by any naturalist in any standard work on reptiles, and no museum nor collection in the world contains a specimen of it. It exists only in the minds of the ignorant and unscientific, and it must be classed with ghosts, mermaids, winged snakes, sea serpents, and fishhook-tailed fishing snakes.

The second question is: "Is the bite of the black snake poisonous?" The common black snake of the United States, Bascanium constrictor, is not armed with poison fangs and glands, and consequently is non-venomous. Its specific name, constrictor, is a misnomer. Linne, its first describer, who never saw a living specimen, was wrongly informed that it crushed its prey in its folds like the boas.

The black snake of Australia, Pseudechis porphyriacus, is a venomous species much dreaded by man.

C. FEW SEISS.

Natural Gas in Wheeling.

The natural gas supply is becoming scarcer every day in Wheeling, and there is especial complaint among the manufacturers, who had hoped that during warm weather they would have all the gas they needed. For several weeks past the Riverside Tube Works lack of gas, and at times during the day have been compelled to lay off until the flow became better. This now getting things in shape as rapidly as possible to go back to the use of coal in the tube works. The Bellaire Mill has gone back to the use of coal, and is using it in all departments. The Labelle is also receiving a very inadequate supply of gas, and it is understood they contemplate a return to coal in all departments. Several of the other mills and other manufactories are in the same position. The manufacturers have at last come to the conclusion that something must be done to protect themselves, and in view of this state of affairs the prospects are that a thorough test will soon be made in this vicinity for gas.—Register.

Sad Fate of Mr. Donkin, the Mountain Photographer.

Those who are fond of seeing the magnificent photoexhibition in the picture shops do not realize the daring that is required to procure them. One of the time it was known that he had been killed, but the In presenting himself before the delegates of the manner of his death was in doubt, and there were painful rumors current that he had been slain by the natives. But to ascertain the facts a party led by Mr. Mount Dychtan to search for evidence. They found the photographic outfit of the unfortunate man at the brink of a precipice under such circumstances as to leave no doubt that he and his companions had slipped over the edge and been instantly killed.

Tangent Galvanometer.

In the tangent galvanometer described on page 181, current volume, the inner coil of no resistance is a copper band, the outer coils are of copper wire, of the following sizes and approximate lengths: Coil b, 150 feet of No. 18; coil c, 336 feet of No. 24; coil d, 373 feet of No. 30; coil e, 368 feet of No. 34.

A HAND EXERCISER FOR PIANISTS.

A simple device, so small and light that it can be conveniently carried in the pocket, and designed to afford ready means for exercising each and every muscle



BIDWELL'S POCKET HAND EXERCISER.

of the hand and wrist, to attain elasticity and rapidity of action as well as strength, is illustrated herewith, and has been patented by Mr. G. Hudson Bidwell, of No. 145 West Sixty-first Street, New York City. The device, as shown, is made with a light chain or cord, having a stirrup at one end and a snap hook at the other. For exercising the wrist and forearm, a heavy rubber band, with eyes or rings at the ends, is connected with endless belt, which is placed so as to encircle one of the of special interest. Owing to high speed and shortness the snap hook and with a bar adapted to be placed up-

on the back of the hand or the inner faces of the fingers, this bar to be held from displacement by a short band and ring to be grasped by the hand that is not being exercised. Bands of different degrees of elasticity are connected with the snap hook, for use as desired, and a finger cap is provided, which may be brought into engagement with any of the eyes or rings, to facilitate the exercising of the individual fingers. This device is designed to do away with much of the annoyance and tedium of piano practice.

AN IMPROVED ASH SIFTER.

An ash sifter designed to be entirely dustless, and the labor of operating which is very light, is illustrated herewith, and has been patented by Mr. Joseph E. Crosby, of Westfield, N. J. The ash box proper has a hinged door at one end, secured by a hook and eye, and has an opening on top for about half the length of the box. At the side of this opening is hinged a

to two opposite sides of the sieve, to form projections thus applied will cause an ordinary belt to slip. extending slightly above its top or open end. A crank



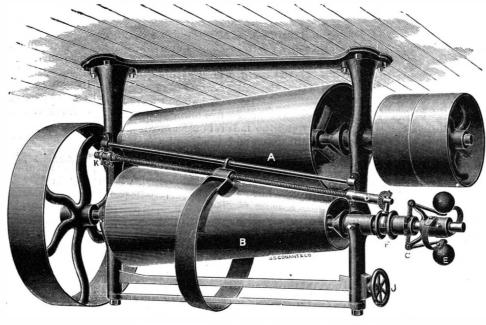
CROSBY'S ASH SIFTER.

rod is centrally journaled in the hinged cover of the are pressed together they are in gear, and the driving and the upper ends of a U-shaped air supply tube enter sieve box, a round cover to fit on the top of the sieve cone will actuate the other with a velocity dependent and are secured in these apertures. This tube embeing fixed to the inner end of this rod, this cover hav-

sifter is closed and the crank turned, a rotary motion will be given to the sieve. The ashes are brought to the sifter in a circular pan of the ordinary kind, to be placed bodily in the bottom of the sifter when in its open position. The ashes are not poured in, as in some other sifters. The hinged cover of the sieve box is then closed down and hooked in place, and the sieve box itself is closed down upon the ash box, leaving no openings for the escape of dust and ashes, when the rotating of the sieve by means of the crank turns the ashes down out of the ash pan and sifts them thoroughly, the ash pan normally remaining in position against the bottom of the sieve from the centrifugal force given by the turning of the crank. After the sifting is completed, and the dust has settled, the coal remaining falls back into the ash pan when the sieve box is again raised to a vertical position. The hinged door at the end of the ash box provides for the ready removal of the ashes when desired, or a suitable removable receptacle may be placed there to receive the ashes direct from the sieve and obviate the necessity of any rehandling.

THE EVANS SYSTEM OF FRICTIONAL GEARING.

A new departure in a well known subject of engineering practice is always of interest. We illustrate in the present issue an improvement in frictional gearing that may be properly termed such an innovation. It is the Evans frictional gearing. The simplest application may be seen in two cylindrical or straight-faced band wheels. If such wheels are pressed together, and if one is driven by power, it will cause the other to revolve, provided the frictional coefficient of the contact surfaces is high enough. In the Evans device this necessary element is introduced by the application of a short wheels, the driven one. It does not fit it tightly, but of belts, much difficulty has been experienced in this



EVANS' FRICTIONAL GEARING AND GOVERNOR.

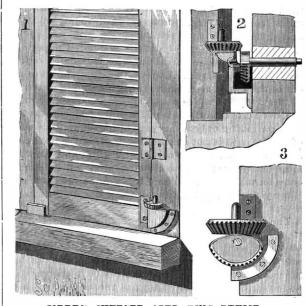
sieve box, also having a hinged cover, the whole adaption is considerably longer than the circumference of the presents an improved lamp recently patented by Mr. ed to fold down and close the opening in the top of the wheel in question. If with the band in position the ash box, as shown in the sectional view. The sieve is two wheels are pressed together, a very high coefficient cylindrical in form, its bottom being closed by a disk of friction is established, and one that is independent centrally journaled on a stub or bolt in the lower end of the tensional strength of the belt. The wheels can der, and Fig. 4 a plan view of the burner. The lamp is of the sieve box, and rods pass up on and are attached be made to grip with great power, and an Evans belt

> On these lines a variety of applications have been made. In all of them a loose frictional belt is employed, and the shape of the pulleys driving and driven are arranged to conform with the work to be done. In the simple case of two straight-faced wheels any desired variation in size, so as to modify the velocity, may be given to the wheels respectively. Simple mechanism for pressing the pulleys together or releasing them is used when machinery is to be thrown into and out of motion.

> Right-angle gearing, a substitute for miter-cut cog wheels, is the next step. For this purpose the two wheels have coned faces, so that when in full contact their axles shall be at right angles to each other. A conical belt is used, which surrounds loosely one of them. To throw them in and out of gear, the shaft carrying one of them is moved either in the direction of its axis or at right angles thereto. The endwise motion of shaft is, for many reasons, the most advantageous, and has been adopted by the company.

> One of its most important applications is to variable speed gearing. For such purpose two long truncated cones are used, arranged with their axes parallel. This brings the base of one opposite the truncated apex of the other. A narrow belt loosely encircles one of them. It is held in place by guides. When the cones on the position of the belt. This may be shifted from

tending up the sides of the sieve, so that when the speed, and may be actuated either by a hand shipper or automatically. In the cut the automatic system is shown. A centrifugal governor acts upon a long screw that moves the shipper in one or the other direction,



JORRES' SHUTTER OPERATING DEVICE. [FOR DESCRIPTION SEE PAGE 213.]

so as to maintain a constant velocity. It is easy to see that a similar system could be used for automatically changing a constant speed of motion into a variable one, as where a gas engine has to drive a pump at varying speed.

The application of this gearing to dynamo driving is

class of work. Air cushioning, accompanied by slipping belts, has occasioned much trouble. In many cases space is of value, and short and inefficient belting has to be used. The Evans gearing enables the motor to be placed near the dynamo, thereby economizing space, and does away with the usual difficulties experienced with belting. It affords an instance of straightfaced pulley transmission, alluded to in the beginning of this article.

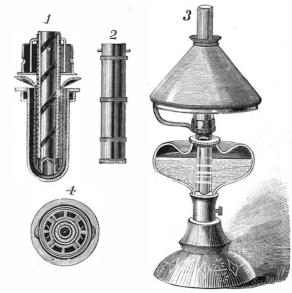
The power of the gearing has been shown experimentally by comparing it with that of an ordinary belt. Both were subjected to the same strain of tension for the belt and of compression for the gearing, and caused to work against each other. The belt was found to slip, while the frictional gearing held intact.

The address of the company is the Evans Frictional Cone Co., 85 Water Street, Boston, Mass.

AN IMPROVED LAMP.

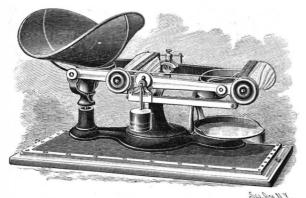
The accompanying illustration re-

Joseph E. Bissell, of Bartold, Mo., Fig. 1 showing a central sectional elevation of the lamp burner, Fig. 2 a side view of the longitudinally slotted wick-protecting cylinprovided with an Argand burner, which has a cap plate with a threaded neck, the cap plate being formed with two apertures at opposite sides of this outer tube or shell,



BISSELL'S LAMP.

braces the lower part of the burner, and is apertured ing notches to engage the projections of the rods ex-lend to end of the cones, giving a very wide range of in the upper side of its bend, the lower open end of the central air tube registering with the opening and being another cap, extending also to the binding posts of the per ends of the U-shaped air supply tube will pass air tube to the flame. The lower end of the outer tube is also secured to the U-shaped air supply tube at the upper side of the bend to form two oil supply openings,



WANDS' PRICE INDICATOR FOR SCALES.

which allow the oil to flow freely to the wick, no transverse oil supply tubes leading into the outer tube being necessary. The upper ends of the U-shaped air supply tube are protected, and the draught steadied and regulated, by overhanging caps which project from a ring on the outer tube above the cap plate.

AN IMPROVED HIGH AND LOW WATER ALARM.

A device for attachment to steam boilers, water fluid falls below or rises above the prescribed limit, is

soldered or brazed thereto, so that air entering the up- alarm bell. With the water at its normal level, as shown in the illustration, the floats balance each other, downward to its bend and upward through the central but on the rising or falling of the water to the position of either float, the levers pivoted on the central arm are tilted to raise the rod carrying the upper float, so that its upper prolongation reaches the contact point of the wire connected with the battery, thereby completing the electric circuit and giving notice by means of the bell that the level of the water is either too high or too low, a point which is determined by looking at the water gage. Fig. 2 shows a modification of the device, in which the tilting levers are fulcrumed in slotted cones connected by a section of gas pipe, the upper cone being attached to the top of the cap.

AN IMPROVED PRICE INDICATOR FOR SCALES.

An attachment for weighing scales, designed to indicate the value of any fraction of a given unit of weight. at any price per unit from one to one hundred, is illustrated herewith, and has been patented by Mr. Lucius L. Wands. Two cone-shaped indicators are used, divided into sections running at right angles to the axes of the cones, each section divided by lines parallel with the axis of the cone, and in connection therewith are arranged strips divided into sections corresponding with the cone sections, and numbered from two upward upon one strip, on which all the even numbers appear, the sections of the other strip being numbered with the odd numbers. In connection with the cones is a mechanism whereby they are each rotated by the movement of a balancing weight, the movements of the cones betanks, etc., to give an alarm when the water or other ing in proportion to the distance traversed by the illustrated herewith, and has been patented by Mr. the reading of the cones, wires are provided which run of the lower shaft carrying the pulleys operating the Daniel H. Streeper, of Norristown, Pa. A suitable in close proximity to the surfaces of the cones, and di- endless belt having secured thereto a pulley over which vessel is vertically connected with one side of the boiler | rectly above and parallel with their axes. For further | passes a belt driven from the thrashing machine with

AN IMPROVED BAND CUTTER AND FEEDER.

The accompanying illustration represents an attachment for thrashing machines for cutting the bands of the sheaves of grain and delivering the grain to the



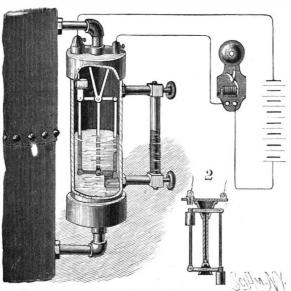
COOK'S BAND CUTTER AND FEEDER FOR THRASHING MACHINES.

feeding drum of the thrashing machine. It is a patented invention of Mr. Henry C. Cook, of Mount Joy, Iowa. The main axle of this band cutter and feeder supports the side beams of an elevator over the table weight upon its supporting beam, while, to facilitate of which travels the usual endless belt, the outer end



THE REMINGTON-LEE MILITARY MAGAZINE RIFLE,

above and below the water line, so that the water will information relative to this price indicator address Mr. | which the attachment is used. On the side beams of stand at the same level in the vessel and in the boiler. To the inner side of the cap of this vessel is attached a downwardly extending arm, forked near its upper end, and to this arm two levers are centrally pivoted, one at the lower end of the arm and the other at the point where it is forked. To the ends of these levers, at one side, is pivoted a rod carrying at its upper end a float, and to the opposite ends of the levers is pivoted a rod carrying a float at its lower end. The rod carrying the upper float is prolonged upward through a



STREEPER'S ELECTRICAL HIGH AND LCW WATER

of this tube is clamped a cap through which projects the contact point of a wire connected with one pole of a battery. A wire connected with the other pole of age distance of 1,347 feet down stream, one going 4,844 the battery is received in a binding post attached to feet, the shortest trip being 480 feet.

Hewitt Boice, Rondout, N. Y.

THE REMINGTON-LEE MILITARY MAGAZINE RIFLE.

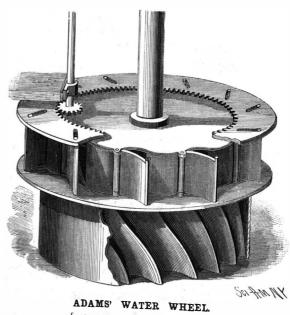
This is the gun which has received the most pronounced recognition by the British government as their service arm to take the place of the single-loading Martini-Henry.

It has also quite recently been officially adopted by the United States Navy Department, and orders have been executed at the Remington Armory for a supply short section of tube in the cap, and to the upper end for the new cruisers, using Union metallic cartridges of caliber 0.45, 70 grs.

The success of this gun in the hands of the undisciplined Chinese troops during the Tonquin campaign of 1884 when pitted against the magazine rifles in the hands of the French, and with its other and more recent triumphs in competitive government trials, both in this country and in Europe, pretty clearly determine the superiority of this type of magazine guns. The caliber of the Lee rifles sold to the Chinese was 0.433, using the same cartridge as is used on the regular Remington rifle of Spanish model, which has been sold all over the world, and interchanging with the ammunition supplied with that famous weapon. The caliber adopted by the English government is 0.31. It is not surprising, therefore, that the other nations of Europe are adopting systems which, if not wholly of the Remington-Lee type as to breech mechanism, are in other particulars quite like it, France alone retaining the tubular magazine in connection with a smokeless powder for which they claim wonderful penetrative power. Hartley & Graham, Nos. 17 and 19 Maiden Lane, this city, are the manufacturers of the Remington-Lee magazine rifle, and will take pleasure in exhibiting the gun at their warerooms.

DURING the Conemaugh flood, thirty-two locomotives, some of them weighing 91,640 lb., were tossed

the elevator is a frame supporting a hopper with the usual central opening leading between two longitudinally fluted rollers, one of which rotates in fixed bearings and the other in transverse slots, where the ends of its shaft are pressed by springs, so that the roller will yield according to the size of the sheaf fed through the opening. On a transverse shaft mounted at the rear of the frame to turn in suitable bearings are formed four crank arms, in pairs standing diametrically opposite and at right angles to each other, two of these arms being adapted to operate knives mounted to swing



[FOR DESCRIPTION SEE PAGE 213.]

directly under the rollers, to cut the band of the sheaf about like corks, 23 of them being conveyed an aver-held between the rollers, while the two other crank arms give a swinging motion to shakers located alongside the knives and

band is cut. Each of the shakers consists of a bar tapered at its inner end, where it is notched on top, and each of the knives consists of a steel plate pointed near its inner end and provided with knife edge teeth. Our engraving is made from a photograph of a machine now in use, and which is said to give good satisfaction, feeding the grain properly spread from the elevator belt directly to the drum of the thrashing

BUILDING THE ARMORED CRUISER MAINE.

The building of a steel ship resembles in its first stages the building of a wooden one. First comes the keel, then the ribs. The frames are set up, the bends and curves following the desired lines with mathematical accuracy. Practically speaking, the result is a girder. The skeleton ship could be made to rest on its foot and heel, or poise upon its center, and the deviation from a straight line would be slight. The steel cruiser Maine, in course of construction at the Brooklyn Navy Yard, is now in the skeleton condition, most of the frames being up. When completed, she will be the largest vessel ever built for the United States Navy, being of 6,648 tons displacement. The mammoth shed where the work is in progress was erected during the civil war, and is situate at that point of the water line of the Brooklyn Navy Yard where a small flatbottomed ferryboat plies back and forth along a rope connecting the cob dock with the mainland. Doubtless, to its constructors, the dimensions of this shed seemed sufficient for the longest craft that was likely to be built. Yet the prow of the Maine, with its steel ram and spur, extends many yards into the open. Inside this shed nearly three hundred men are now at work.

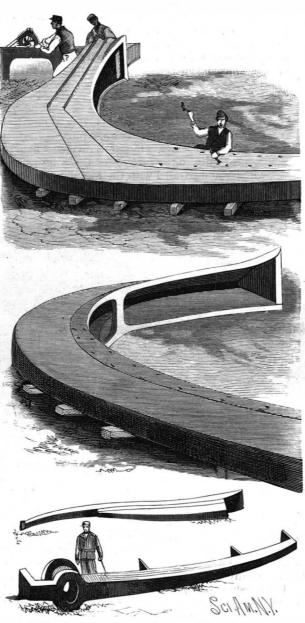
Steel ship building is now become a science, the constructors of the Maine working over charts and drawing boards, and poring over long lines of figures in the second story of a big granite building, instead of directing the shaping of the hull on the spot, as in the old days of wooden ship building. Then the shipwright moulded the bends and knees by rule of thumb, shaving this a little, or sawing and chopping that one to make it fit; a few inches this way or that was of no consequence. But now, every frame, every brace, every girder, indeed every plate, is fashioned in wooden strips in the moulding loft from figures furnished by the designer: the length and breadth, and even the curvature, of the part being closely looked to in the rolling shop or upon the cast iron slabs of another department, before it comes to the building shed.

About a year ago the keel plates of the Maine ar rived at the yard, and the work was begun of laying the keel. The plates are laid in an unbroken line from stem to stern, some of them being flat, some vertical; 40 feet deep in the midship section, and 35 where free from the second hull, the keel line being scarfed at the sternpost and the forefoot. After the keel was laid the transverse frames were raised-lowered would be a better term, as they are slung from cranes, each frame being in two parts, because of the weight and unwieldiness. There are eighty-four of these below the protective deck, made of angle bar 5 by 3 inches and weighing 10 pounds per foot, the reverse bars being 4 by 4 inches. They are braced by longitudinal frames extending also between the protective deck and the keel blocks, the weight and strength of these being increased forward and abaft the double bottom. The longitudinal frames run uninterruptedly from stem to stern, and have been designed and set with the purpose of supporting the shock of ramming as well as keeping the structure intact.

It was found necessary to erect a house in the yard in which to store the various parts of the Maine as they arrived from the steel works. This house is called the plate rack, and is 191 feet long by 31 wide. In it to electricity, the only trouble has been in finding a the plates for the hull are laid out or set up on end in motor that will bear the rough use and exposure. regular order and numbered so that a master workman can tell at a glance where each belongs. The contract with the steel works in Pennsylvania where the work is being done calls simply for so many pieces of this or that size or shape. The contours, bends, ated from the main line of shafting there long since curves, and rivet-holing are all done in the navy yard shops. The frames or plates, as they are needed, are first shaped so as to exactly correspond with patterns that have been made in the moulding loft. These patterns are made of thin strips of wood affixed together so as to follow the exact lines of each piece. A plate, for example, first goes to the roller shop, where it is smoothed out between two great iron rollers, being passed backward and forward and given its proper inclination, thence to the punching shop, where it is punched for riveting on the hull, also a work of great care, for unless the holes be exactly in place they will not correspond with their mates in the frames. At last comes the operation of countersinking, taking off the bulging edge about the holes and countersinking the orifices to receive the heads of the rivets. The frames are first taken to the furnace house and the forge, being then hurried upon the bending slabs, a great raised flooring of heavy steel plates perforated with holes. The wanted shape having already been laid out

of pries and levers in the hands of the workmen; one putting in a pin here to keep the curve secured, and others still pressing and tugging away to bend still more. Thus, when at last a piece arrives at the shed, the workmen have only to raise it and drive the rivets home through the corresponding holes in plate and frame, the foreman having shown them by reference to his drawings exactly how it is to fit.

A feature of the work on the Maine is the use of electricity as a driving and forcing power in putting the parts together on the structure itself; the first time, be it said, in the history of ship building, that it has thus been employed, and so far, for it has only recently been introduced, gives good promise. "The subdivision of power aboard a ship under construction, for use by the workmen at different parts of the framework, would," says Assistant Constructor Woodward, 'be possible in several ways, either in sending it aboard the ship by a wire rope in transmission from a steam engine on the dock, the rope turning a system of shafting and belting, or by using hydraulic pipes to drive light and portable engines. The first is costly in time and labor to establish, the second is impracticable, because in the winter the water freezes in the pipes. As



CASTINGS FOR RAM BOW AND STERNPOST OF THE MAINE.

After some experiment we found that several of the established electrical companies possess such motors. In the present method of utilization, the dynamos for generating are set up in the tool shop, being operestablished. A secondary battery of 50 cells is used as a regulator to allow for variation of speed in the main shafting. The current is conducted to the building ship by ordinary conductors and distributed so as to energize the various motors in use."

The Maine has two bottoms or skins, braced stoutly one over the other, so that in case she strikes upon a rock and tears the under hull or skin, the only effect will be to admit the water between the two hulls and give her a lower set in the water for the loss of buoyancy, but remaining staunch and seaworthy. It may be said, in passing, however, that the precaution of double hulls would not save her if she were run upon a torpedo properly placed; though even then, unless the hull were badly shattered, the watertight compartments which divide her hull into isolated sections might serve to keep her afloat.

Each compartment of the double hull is complete, having a separate section, and may be flooded or emptied by means of powerful pumps and ejectors, in chalk, the piece is bent this way and that by means these being connected as well with the various and

separate compartments between the protective deck and the false bottom, the number of each being set in an indicator in the engine room and requiring but the pressure upon a valve to do their work. In the watertight compartments below the water line, and above the false bottom, are the magazine, shell room, and military stores room.

Not until after the Maine is launched will the great steel armor belt be fitted that is designed to protect her water line from hostile bolts. The reason for this is the great weight it will add, and consequently greater difficulty of launching. This belt will be made up of solid steel pieces. 13 inches thick, the first tier resting upon what is called the armor shelf, which will be seen by reference to the frontispiece immediately a-top the girders where the perforated beams end. These slabs of the armor belt will be backed by about four feet of solid oak and, at certain points, be still further supported by enormous coal bunkers.

The protective deck, which covers all, will have a maximum inclination of four feet, the plane of it being 3 inches, and the slope 41/4.

Looking at the model of the Maine up in the designer's room, she is seen to be, when complete, a bark-rigged vessel, her bow sheering into a formidable ram just below the water line, the stern coming inboard instead of going outward at the quarter rail (see Fig. 2), with consequently no overhang and nothing above the water line to indicate that she possesses a sternpost or a rudder, for the latter are deeply submerged.

With brace and stretching piece, the flanges of the sternpost will be held, the same being used as supports for the end of the propeller shafts. Both stern and stem posts are of cast steel, rabbeted for the bottom plating to get a stout inset and powerful clamping; the under ends scarfed to the plates of the keel with canting-frame strengthenings to increase the backing of the ram. The rudder, a ponderous piece of steel, will be seen illustrated in the lower right-hand corner of the frontispiece, the sternpost and its lever in Fig. 3.

The engines and boilers are being made in a private works, and will be put aboard when the ship is launched. The engines will be of the vertical tripleexpansion type, having eight boilers and three furnaces. The screws will have three blades, with a diameter of 15 feet each. There will be a coal capacity of about 800 tons, and, if the promise made for her should be realized, will be good for 17 knots under full headway, and at 10 knots headway be good for a voyage of 7,000 miles. Her battery will consist of four 10inch breech-loading rifles, mounted two and two in echeloned turrets; six 6-inch breech-loading rifles; and a secondary battery of rapid-firing small guns, some below, some on the main deck, and a full battery of them atop each of the military masts.

Besides these, there will be seven torpedo-launching tubes or guns, four of these being on the berth deck, and three below the water line. There will be a bolt of 500 pounds weight fired from the 10-inch guns, the charge being 250 pounds of powder, the maximum range 9 miles. Both in the foreand after battery there will be a total weight of 2,200 pounds of solid metal that can be thrown at one discharge, and from either broadside about 100 pounds more than this. She will spread 7,135 square feet of canvas with everything clapped on, and carry a crew of about 350 officers and men.

Vine and Olive in Algeria.

In British Consul-General Playfair's report to the foreign office on the agriculture of Algeria, it is said that viticulture in that country is beset with many dangers. In spring, hailstorms frequently destroy the young shoots, the flowers are often ruined by fogs, and the ripe fruit by the sirocco. The most serious enemy is, of course, the Phylloxera, but the officials have been fairly successful in dealing with this pest. Another is the altise, a small beetle that causes great destruction, particularly when in its larval condition. The mode of killing the altise commonly adopted is to place bundles of grass and vine cuttings around the yard when winter is approaching; in these the insects conceal themselves in large compact masses, and the whole is then set on fire. Other diseases are the oidium, anthrachnosis, peronospera, and chlorosis. It is calculated that the want of intelligent treatment of these diseases causes the owners of the vineyards to lose annually nearly a third of the crop. The olive seems to grow everywhere in Algeria except in marshy ground, and attains dimensions quite unknown on the northern coast of the Mediterranean.

Prof. George H. Cook.

We have to announce with deep regret the news of the death of Prof. George H. Cook, State Geologist of New Jersey, and vice-president of Rutgers College. He died suddenly at his home in New Brunswick, on the afternoon of September 22, from failure of the heart, in the 72d year of his age. In a later issue of this paper, his life will be given at greater length. He was one of our most active scientific workers, and his death is a blow that will be widely felt.

AN IMPROVED WATER WHEEL,

A turbine water wheel designed to reduce friction and increase the effective attainable power is illustrated herewith, and has been patented by Mr. Henry J. Adams, of North Jay, Me. The buckets of the wheel extend in a reverse spiral line down its sides, and the wheel is inclosed in a casing made in two sections, a lower cylindrical section fitting loosely over the buckets, and a larger upper section having a sinuous peripheral wall, at the base of which is a flange, the top of the casing being closed and the bottom open. The inner bends of the sinuous peripheral wall of the top casing are on the line of the periphery of the lower section of the casing, and the outward bends form guides for the water to the wheel, openings or gateways being made at the inner bends and extending partly along the outer bends. Hinged to the sinuous peripheral wall within the top casing are gates, conforming in contour to its sinuous surface, so that when the gates are open, a curved surface will be presented to facilitate the passage of water to the wheel. The outer edges of these gates have lugs at the top, movable in inclined slots in a flat ring on the top of the casing, so that as the ring is rotated in one direction or the other the gates will be opened or closed, the ring having teeth on its inner edge meshing with the teeth of a pinion on a vertical shaft provided with a suitable handle or lever at its upper end. To obtain the full and best effect the buckets have a downwardly and backwardly trending and curved upper portion, starting from a vertical line at the top equaling in length about the height of the water inlets, and a lower portion, ending in a vertical line at the bottom, extending from the curved upper

portion in a reverse spiral line, the concave face of the curved upper portion gradually widening at the edge or lip as it continues into the lower portion, while the buckets are concave on their face and have a convex back surface throughout their length.

Large Bending Rolls.

The large bending rolls that the Niles Tool Works are now building for the Mare Island Navy Yard, San Francisco, possess very interesting features. This machine will bend mild steel plates 2 in. thick by 22 ft. wide. It is guaranteed to bend armor plate 11% in. thick by 22 ft. wide. The work is done by four forged rollers, two in the center, arranged one vertically over the other, to grip the sheet between them, and one on either side of the center to bend the sheet.

All the rollers are solid forgings. The center rollers are 32 in. in diameter and 22 ft. 6 in. long in the body, and weigh each 65,000 lb. The side rollers are 26 in. diameter, of the same length as the center rolls, and weigh 45,000 lb. each. The center rollers are geared together and driven by a pair of 12 by 16 in. reversible link engines. By these rollers the sheet is carried through. The side rollers, which bend the sheet to the required curvature, are not geared, but revolve by friction against the sheet. They are raised and lowered by heavy screws driven by a

operations are controlled by levers conveniently placed for the operator. The weight of the machine complete will be about 220 tons. The rollers were forged and $turned\ by\ the\ Cleveland\ City\ Forgeand\ Iron\ Company.$

AN IMPROVED SHUTTER WORKER.

A device by means of which window shutters may be opened or closed without raising the sash, and so arrange ed that when the shutter is opened it is held against ac cidental displacement, is illustrated herewith, and has been patented by Mr. Ralph W. Jorres, of Thomaston, Conn. Fig. 2 represents the device applied, with the shutter in open position, Fig. 3 being a sectional view, and Fig. 1a view in perspective. To the window casing is secured a bracket having an upwardly extending pintle, and with a stop or limit plate, and a recess which serves as a bearing for the outer end of a shaft extending inward through the window casing, the inner end of the shaft having an operating handle. This shaft carries a segmental gear on one side, and on the other a flanged eccentric section, as shown in Fig. 3. To the corner of the shutter or blind is secured a horizontal disk carrying a segmental bevelgear, the disk being centrally apertured to receive the pintle on the bracket secured to the window casing. To hold the shutters in open or closed position, keepers are provided, formed with vertical flanges. With the parts as shown, when the operating handle of the shaft is turned to swing the shutter to closed position, the shutter is first raised vertically, carrying it clear of its outer keeper, and as the shutter is moved to a closed position the gears pass from engagement with each other, and the eccentric flange again bears on the under side of the disk secured to the shutter, permitting the latter to gravitate to its lower position within the line of the flange of the central keeper on the window sill.

ELECTRO-PLATING DYNAMO.*

The electro-plating dynamo differs from an electric lighting dynamo chiefly in its winding. For metallurgical work a large current of low voltage is required. For electrotyping, an electro-motive force of three to four volts is sufficient, while for nickel plating it should run up to about six volts, and for silver plating to about five.

In a small dynamo, like the one illustrated in Fig. 1, it is impossible to secure as wide a range of electromotive force or of current as can be realized in a larger machine, but by varying the speed and by introducing more or less resistance in the external or internal circuit, the current can be adapted to most uses of the amateur. In the construction of this dy- through the field magnet.

namo all of the dimensions of the cores and polar extremities of the field magnet and of the armature core, as given in the description of the hand power dynamo in SUP-PLEMENT, 161, are followed except in regard to the thickness of the waists of the field magnets and their polar extremities. These dimensions are here increased by adding

1/2 inch to the thickness of the waists and 1/4 inch to the thickness of the polar extremities, thus increasing the amount of iron in the field magnet.

The armature is wound with five layers of No. 12 cotton-covered magnet wire, and the terminals of the coil are connected with the halves of the commutator cylinder as shown in Fig. 2.

The commutator cylinder is formed of two sections

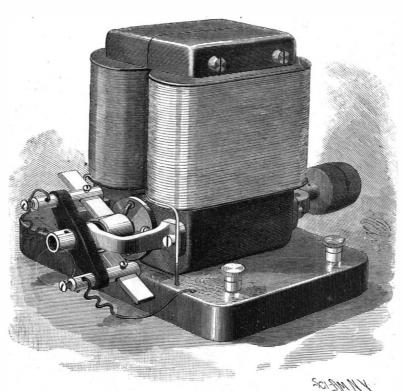


Fig. 1.—ELECTRO-PLATING DYNAMO.

pair of 10 by 12 in. reversible link engines. All of the cut from a copper tube and mounted upon a hub of The first 56 miles are nearly completed, the rails being vulcanite, or vulcanized fiber, the tube sections being separated from each other so as to form diagonal slits in diametrically opposite sides of the cylinder, as shown.

The brushes are supported by mortised studiinserted in the ends of a cross bar of vulcanized fiber mounted on the journal box of the armature shaft. The threaded ends of the mortised studs project through the cross bar to receive binding posts which are screwed down tightly on the bar. In the mortises of the studs are placed the brushes, which press lightly upon the commutator cylinder. The brushes are formed of several thicknesses of thin hard-rolled copper.

The field magnet is wound with 12 layers of No. 18 magnet wire and is connected as a shunt to the armature. That is to say, the terminals of the field magnet wires are connected with the same binding posts that receive the wires from the commutator brushes, as shown in Fig. 3.

The conductors of the external circuit are also connected with these binding posts. When the connections are arranged in this way the current divides at the binding posts referred to, a part going through the wire of field magnet, another part going through the external circuit, which in the present case includes a plating solution.

To the negative conductor is attached the cathode or the plate or object which is to receive the deposit, and upon the positive conductor is suspended the anode or plate from which the metal for the deposit is supplied to the solution.

Unless the dynamo is at first started with a battery in circuit, it will be impossible to tell, without a test of some sort, which is the positive and which the negative binding post. This can be determined in a moment by trial in the plating solution.

*From "Experimental Science," by George M. Hopkins. Munn & Co., publishers, New York.

If on starting the machine a deposit is made on the cathode, the connections are correct. If, however, no deposit appears, the conductors should be transposed either at the dynamo or at the plating bath.

Large wire should be used for carrying the current. Within certain limits the electro-motive force of the current may be varied by changing the speed of the machine, and the current may be controlled by inserting resistance into the external circuit or into the shunt.

The hand power dynamo referred to above may be converted into a shunt machine by arranging the connections according to Fig. 3, but it will be necessary to introduce resistance into the shunt or field magnet circuit to prevent too much current from going

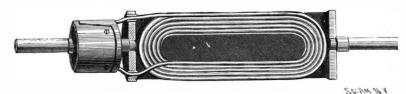


Fig. 2.-ARMATURE OF ELECTRO-PLATING DYNAMO-HALF SIZE,

The electro-plating dynamo may be used successfully in copper, nickel, and silver plating on a small scale, also for electrotyping.

The length of wire on the armature is 40 feet and on the field magnet about 500 feet.

The Transandine Railway.

It is gratifying to note the progress which the Trans-

andine Railway is making, due chiefly, says Ingineering, to the energy with which Messrs. J. E. & M. Clark & Company are prosecuting the last and most difficult part of the work. The Andes are being crossed at the Uspallata or Cumbre Pass, where there will be a tunnel 3.1 miles in length, at an elevation of 10,450 ft. above sea level. The pass itself is nearly 3,000 ft. higher, or at 13,015 ft., and is situated 41/4 miles south of Aconcagua and 3.84 miles north of Tupungato, in 33° S. latitude. It will thus be seen that the summit level of the Transandine Railway is far above any European lines, which at the Rigi reach to 5,753 ft., and at the St. Gothard 3.788 ft.

The total distance from Buenos Ayres to Valparaiso is about 871 miles, and railway construction has now been going on for nearly twenty years. At the Atlantic end 640 miles of line are complete, while at the Pacific end 82 miles are laid, leaving 149 to be built. The gauge is uniform. From Buenos Ayres to Mendoza it is of 5 ft. 6 in., 426 miles being worked by the Buenos Ayres and Pacific Railway Company, and 213 miles by the Great Western Railway Company. From Valparaiso to Santa Rosa the gauge is 4 ft. 81/2 in. The remaining link from Mendoza to Santa Rosa is now being built on meter gauge by the Buenos Ayres and Valparaiso Transandine Railway Company.

laid for 40 miles.

According to the Zeitung des Vereins Deutscher Eisenbahn-Verwaltungen, an alteration of route has been made in the remaining part, and the ruling grade of about 1 in 25 has been abandoned. This change has been dictated by the adoption of the Abt system of combined adhesion and rack rail traction. The grades are

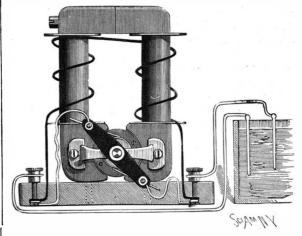


Fig. 3.-CONNECTIONS OF PLATING DYNAMO.

now to be 1 in 40 in the adhesion sections and 1 in 121/2 upon the rack sections. The rack rail will consist of three rack bars, as at the Hartz Railway, and the order for it has already been placed with Messrs. Rinecker, Abt & Company, of Wurzburg. In the meantime, the Abt system has been adopted on the Ostrocas-Serajewo line, more especially for the passage of the Twan range.

IMPROVED WEB PRINTING MACHINE.

The constant demand for printing machinery capable of producing good illustrated bookwork at a fast rate has induced several of the printing press makers to turn their minds to that description of machine. Our illustration represents a machine lately brought out by Messrs. Marinoni, of Paris, and built to the order of Messrs. Judd & Co., Limited, the Phænix Printing Works, London.

Several important new features have been introduced into this machine. The paper, which is in reels, is fixed at one end of the machine, and as it unwinds between the reel and the first printing cylinder, it passes over a horizontal shield, which is heated by gas or steam. Under the influence of the heat the paper gets softer and will more readily take the ink. In fact, the heating of the paper replaces advantageously the old tion, Is there any danger to our protective system in process of dampening. At the same time the ink dries rapidly and the "set-off" is very considerably reduced. However, to guard against this a continuous "set-off"

No Longer English, but American Capital.

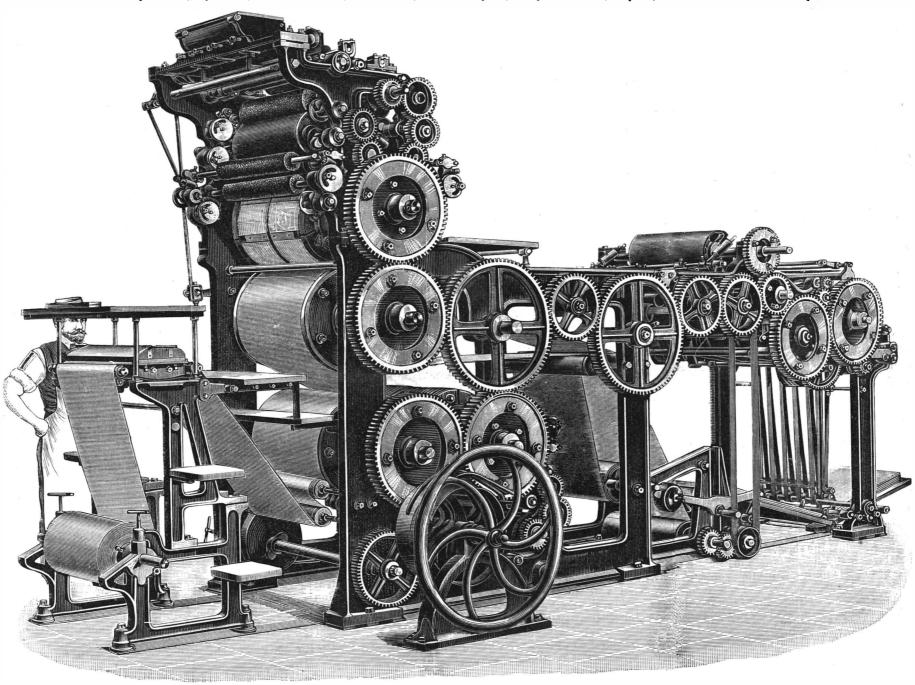
Still the acquirement of large American plants goes merrily on, says The Iron Trade Review. Not to speak of the breweries and land companies and Western mortgages recently absorbed, the important news of the day is the proposition of an English syndicate (presumably the same one which purchased the Otis Iron and Steel Works, of Cleveland) to buy the extensive works of the Thomas Iron Company, at Hokendaugua. Pa. Proxies are now being taken among the stockholders for a vote, upon the question of sale, and it is announced that this, if effected, means a sort of iron and steel trust-though wherein the ownership of two concerns can be made to constitute a trust, does not at first appear.

These movements again press to the front the questhe absorption of American concerns by foreign capitalists? The New York Press has thought the question of sufficient moment to address letters of inquiry to sheet is run round the perfecting cylinder; and as it leading Americans, and the replies, many and varied,

money they want; then, when it begins to look as if they meant to gouge us, let us legislate a little, and show them the power of a popular government by pinching their toes in the trap they set themselves."

Upon the same point, the Anniston (Ala.) Hot Blast says: "The probabilities are, of course, that the earnings of these properties will go abroad rather than remain at home. The probable consequence of such purchases is that they will lead to the coming here of a great many people who profit by such purchases. In itself, there is no particular harm to be anticipated from this tendency. It matters very little where the persons live who make the dividends, but of course it would be better to have them here to spend their moieties than abroad. Things like this regulate themselves. One thing about these Englishmen is that they pay big prices for what they buy and pay spot cash. They do not ask credit, don't jew us down, and treat us liberally and honorably."

Yes, we can stand any amount of influx of foreign capital, but it should be distinctly understood from



IMPROVED CONTINUOUS WEB PRINTING MACHINE.

also comes from a continuous reel which unwinds itself are extremely interesting. While many see in the the start that, once invested in America, it becomes as the machine is working, the other end is wound up present movement a menace to American interests, again by friction between two grooved rollers, driven unless carefully guarded by appropriate legislation, at such a speed that their circumferences travel at exactly the same rate as the printing cylinders.

Another feature in this machine is that tapes are entirely done away with, and the continuous web travels and as yet imperfectly developed, field for investment, by itself to the cutting cylinders, from which grippers with the increase of capital, and the consequent lowertake the separated sheets to a vertical delivery flier ing of the interest rates, the results, it is argued, will folded as soon as they leave the cutting cylinders, the the well-known firm of Marshall Field & Company, of grippers take them on to a folding cylinder which gives | Chicago, puts it: "These English investments have a perfectly accurate fold, and the subsequent folds are already brought over some of the best of British subgiven in a special folder without tapes. The machine jects to America. Where the treasure is, the heart is has been designed with a view to increased distribution also. When they do come to live with us, the investof ink and full rolling power, and several devices have ments cease to be English and are positively Ameribeen adopted to regulate the inking, even when the can." Answering the objection that, while the investmachine is running.

All the working parts of the machine are perfectly accessible, and the paper as it goes through the machine is never lost sight of. This machine will print and fold a four-demy sheet on illustrated bookwork of lating influence of this outside capital? What if the the highest description at the rate of 5,000 perfect copies per hour.—Engineering.

ABOUT 150 colors are now obtained from coal tar, which has almost entirely supplanted vegetable and

the general consensus of opinion, summed up in the two samples given below, seems to be that the more foreign capital we draw in, the better. With a broad, ments remain here, the profits go out of the country, A. Shuman, head of one of the leading Boston houses. says: "Well, but isn't the country just so much richer and isn't the market expanded because of the stimuprofits do go abroad, doesn't the capital remain here? It has to, and we may well allow the exportation of \$300,000 in the shape of profits on a working capital of \$6,000,000. Doesn't that leave America ahead just \$5,700,000 on this little financial transaction?

Let our friends on the other side bring over all the persons, was engulfed in the stream.

American capital, bound to respect American interests, and pay the American scale of wages.

Volcanic Eruption in Turkey.

A correspondent of the London Daily Chronicle states that particulars have reached Constantinople of a volcanic eruption which occurred some days ago in the province of Erzeroum, destroying the village of with a right and left action. If the sheets are to be be beneficial rather than harmful. As a member of Kantzorik and the majority of its inhabitants. Kantzorik was a little village of 215 inhabitants, situated in the Caza of Tortoum, about 60 kilometers (37½ miles) north of the city of Erzeroum. The village nestled in a narrow fertile valley about 1,600 meters above the level of the sea, on the slope of the eastern mountains. Before the eruption the inhabitants were startled by subterranean noises, and they noticed at the same time that the springs on a mountain which stands at the eastern end of the valley were dried up. Alarmed at these phenomena, they appealed to the nearest local authorities, and were advised at once to evacuate the village. The warning for the majority was too late. Toward midday, while the terrified peasants were preparing for flight, the eruption came. The torrent rushed down, bearing on its molten surface bowlders and masses of earth torn from the surface or belched from the heart of the mountain. The whole village, with 136

MOUNT STEPHEN.

The Canadian Pacific Railway passes up the valley of the Bow River, from Banff, ascending the eastern slope of the Rocky Mountain range and entering the province of British Columbia, which is part of the Dominion of Canada. Passing the Summit Station, just a mile above the level of the sea, with three small green lakes in rocky recesses, it proceeds through the Kicking Horse Pass. Here the streams begin to flow westward to the Pacific Ocean. "Ten miles beyond the summit of the pass," says a descriptive writer, "we round the base of Mount Stephen, a stupendous mountain rising directly from the railway to a height of more than 8,000 feet, holding on one of its shoulders, almost over our heads, a glacier whose shining green ice, 500 feet thick, is slowly crawling over the edge of a sheer precipice of dizzy height, from which falling fragments of ice are dashed to atoms below. We look down from the railway, clinging to the mountain side, upon the river valley, which here suddenly widening holds between the dark pine-clad mountains a mirror-like sheet of water, reflecting each peak and cliff with the most startling effect." Some distance beyond is the wide, forest-covered valley of the Columbia River, with the mountains of the Selkirk Range.

between America and Asia, are so narrow and shallow that not much of the icy Arctic current flows along the British Columbia coast. The Rocky Mountains, in British Columbia, trending northwesterly, keep off the cold north winds. Other causes of the temperate climate are the existence of a warm ocean current in the Pacific Ocean, which flows toward the coast, the prevalent warm southwesterly winds from that ocean, which blow over the country, and also the north and south direction of the principal valleys, up which warm air from the south is drawn. The forests yield a vast supply of timber, and the fisheries are of great value. The population of British Columbia is now about eighty thousand, its capital is Victoria, in Vancouver Island.—Illustrated London News.

Prevention of Typhoid Fever.

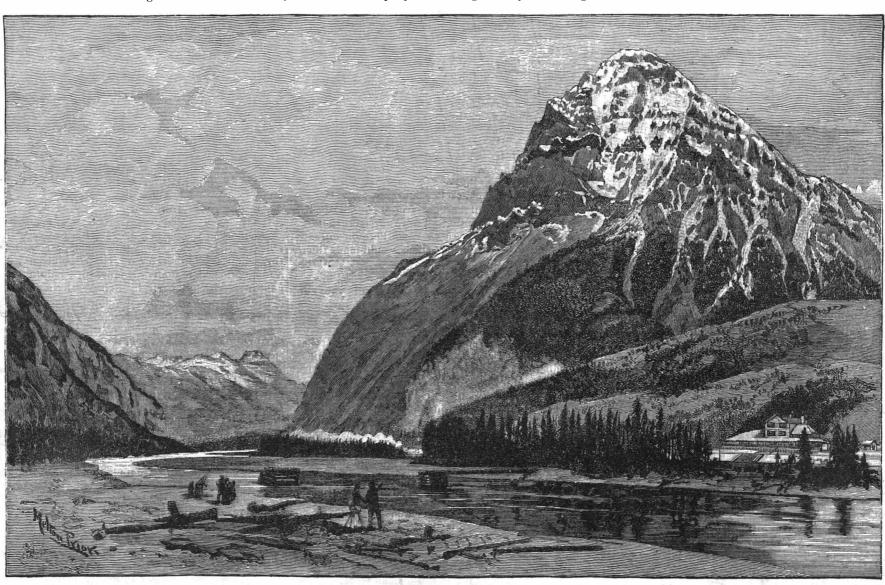
The State Board of Health of Kentucky has issued the following circular, which is important to all sections of the country where typhoid fevers prevail, and especially at this season of the year should its counsels be regarded:

This board desires to call the attention of our health authorities and people to the gradually increasing from all the sources found in the average back yard,

washed in it. Ice, from an infected source, is also dangerous, since it has been proved that freezing does not destroy the infective principle.

While water from all sources of supply is liable to contamination, well water is especially so, whether located in city, town, or summer watering place, or country. Thus out of 314 cases occurring in Louisville in 1884, 298 of the persons used well water habitually, and some of the other 16 did so occasionally. In the now famous epidemic at Plymouth, Pa., involving the sickness of 1,104 persons, the death of 114, and an actual outlay in money of \$67,100.17, the outbreak was traced to the use of water polluted by the fecal discharge of one imported case of the disease. Facts no less convincing might be multiplied indefinitely if space permitted. In a smaller way they are common in the experience of physicians in active practice.

Usually the wells are sunk near the kitchen, and in dangerous proximity to the privy and other sources of contamination. The well draws its supply from an inverted cone, having its apex at the bottom of the well and its base at the surface of the ground. In dry seasons this base is often extended until the well becomes a receptacle for the more or less perfectly filtered filth



CANADIAN PACIFIC RAILWAY-MOUNT STEPHEN, THE SUMMIT OF THE ROCKY MOUNTAINS, BRITISH COLUMBIA.

British Columbia (including Vancouver, Queen Charlotte, and other islands along the coast) is that portion of Canada which looks out on the Pacific Ocean. It is the only British territory on the western or Pacific Ocean side of the North American continent. There is abundant proof of the existence of great mineral wealth in British Columbia. Gold, coal, silver, iron, copper, galena, mercury, platinum, antimony, bismuth, molybdenum, plumbago, mica, and other minerals have and prosperity. Considered purely as an economic the Lower Fraser, or New Westminster district, is the scarcely be overestimated. Statistics show that ten the valley is little above the sea level. This is the only large tract of choice agricultural land, on the upon the ocean, with a shipping port in its midst. A navigable river cuts it through, which is sheltered at its mouth. The Canadian Pacific Railway, as already said, runs through the district. The river is full of salmon and other food fish, and the district abounds with game. The delta lands and the clay loams can hardly be equaled for strength and richness, yielding great yields with comparatively careless cultivation. Much also of the interior is good farming land, and some highland districts afford very fine pasturage. The climate of British Columbia, in general, is much more temperate than the climate of any part of Canada direct from such water, or indirect, by using milk or

prevalence of and mortality from typhoid fever, and to the growing importance of a constant resort to the methods which modern scientific researches have suggested for the prevention of this disease.

These preventive measures are of the more import ance to the State because directed against a disease especially prevalent and fatal among persons in the prime of life, who contribute most to the public wealth been discovered in different parts of the province, cop- problem, the feature of it probably least thought of per being very widely distributed. The rich valley of by most people, the importance of this disease can largest compact agricultural district. It is on the persons are sick for every one that dies of this disease, mainland shore, opposite the southeastern portion of and to say nothing of the cash value to the State of Vancouver Island. The surface of the lower part of | those who die every year—and it is conceded that the State has no more valuable property than that represented in its vigorous population—the loss of time and ling. mainland of the North Pacific slope, that lies actually labor, and the necessary cost incurred in attention to those who finally recover, makes an annual tax upon our people of startling proportions.

Typhoid fever is probably the most preventable of all diseases, not even excepting small-pox. It is now known that, like cholera and dysentery, the germ or specific cause of this disease is contained in the discharge from those sick of it, and that while other methods of introducing the poison into the system are possible, it most generally gains entrance through the medium of an infected water supply—usually the use of well water polluted by fecal matter. This may be lying east of the Rocky Mountains. Behring's Straits, other articles of food or drink from cans or vessels insignificance.

and the water, often sparkling in its apparent purity, becomes a culture fluid for any disease germs finding their way into it.

Two methods of prevention, having the same general object in view, are to be recommended. The first involves the thorough disinfection of all discharges from the bowels of typhoid fever patients. This is best done by the use of a solution of chloride of lime, 8 ounces to the gallon of water, using a quart of this solution for each discharge, and allowing it to stand in the vessel at least an hour before emptying. A solution of corrosive sublimate, 2 drachms to the gallon of water, will answer the same purpose, but requires to remain longer in contact with the material to be disinfected. Bed and body linen soiled by such patients should be disinfected by the use of the same solution or by boil-

The second method relates to avoiding the use of suspicious water, and especially well water, and where this cannot be done, to boil such water before it is used for drinking purposes. In the absence of a pure and well-guarded public water supply, properly stored cistern water is probably open to least objection.

The effectual practice of these methods will require intelligent care and some expense, but it is confidently believed that their general adoption would result in the practical disappearance of a disease which is not only a disgrace to our civilization, but an annual scourge and tax upon the people of Kentucky, in comparison with which yellow fever and cholera sink into

American Workmen Back from Europe.

The party of fifty American workmen who went to Europe in July under the auspices of the Scripps League, for the purpose of looking into the Old World way of manufacturing and finding out how European | The women who make nails and chains at the anvil workmen live, got back to New York September 12.

On the question of the comparative productiveness of the American and foreign workman they were in a unit in support of the superiority of the former. This, they held, was partly because the American worked harder and for longer hours and with fewer holidays than the foreigner, but mostly because of the vast superiority of the American machinery.

A. T. Anderson, the tinsmith of the party, said, "I saw a remarkable exemplification of this fact in Liverpool, where I saw the leading tinsmithing establishment at work turning out a buoy. They were stamping out some half-spheres, and it took them nine processes to accomplish a result that is reached in our stamping works in three processes."

William Hanna, a Cleveland, Ohio, iron worker, said, "I am not exaggerating when I say that if I had in a mill in Cleveland the plant which I saw in operation in a mill in Glasgow, Scotland, I would break that plant up for scrap iron. We tried to get into Cammell's and Brown's works in Sheffield, but they would not let us in. The condition of workmen in my line abroad I found to be decidedly inferior to what it is in this country."

Mr. Cheney, the miller of the party, who is employed in the monster Washburn mill at Minneapolis, said, "At the Paris exposition the foreigners displayed with great pride their lav-out of milling machinery. It was very pretty and bright, but they did not seem to think so much of it when I told them that what they were exhibiting as the latest milling devices I had just taken out of our Minneapolis mill and replaced with improved machinery. Their machinery is too slow. We beat them in swiftness of work every time."

Mr. Ogden, who represented the American printers. said that he found the mechanical part of the printing business in Europe just where he had found it in this country when he learned his trade twenty-two years ago. "The quick men of their composing rooms," he said, "are not up to our slow men. Their stereotypers do quick work. Those who do the work for the 'favorite editions' of the London afternoon dailies, which often run up to 110,000 to 120,000 copies, are as quick as our stereotypers, but their work is not so good, and these papers have a ragged appearance that would not be tolerated here. The composing rooms lack comfort, are poorly lighted, and are un-

"The impress of the American inventor is nowhere more marked abroad than in their shoemaking machinery," said Hugh Cavanaugh, a shoemaker from Cincinnati. "There is a strong indisposition on the part of manufacturers to use improved machinery, and such machinery as they employ is based on American ideas. A workman there, however, is not expected to do more than from 65 to 75 per cent of what an American workman accomplishes. There seems to be no desire to test man and machine to their full capacity. It really costs more money there to make as good a shoe as is made here, but instead of thus producing better machinery in order to produce better shoes, the people are satisfied with the poorer product. With the exception of one or two factories in Paris, none of the foreign makers turns out a shoe that has any pretension to style. The workmen take life easily. They work fifty-four hours in the week and have lots of holidays. They are well organized and are looking forward to bringing down the hours of labor to eight per day. Rents are far cheaper there than here. The president of the Leicester (England) shoemakers' union lives in a comfortable six-room house for which he pays 6s.—about \$1.50—a month. There miles south of St. Paul de Loanda, and pass directly are 30,000 shoemakers in Leicester, and the general run of them have snug quarters of from four to six rooms each."

Mrs. Barry, who is familiar with the condition of workingwomen in this country, who made a thorough investigation of how they fare abroad, said: The condition of women who work in Europe is in many instances deplorable. There is much fault to be found in America, but with a single exception the workingwoman of a given kind in America is better off in every respect than her sister abroad. The exception I allude to is the woman engaged in clerical work. In England she works from 10 in the morning till 5 in the evening. In America she begins at 8 in the morning and ends at 5. But woman's pay in every branch of industry in this country is better than in Europe, and it will cost a woman in Europe far more money than it 12,000,000 feet or more, whereby the cost of transportadoes an American woman to live in the same comfort that the latter does. In the "Black Country" of Devonshire, England, I saw women at the anvil making nails and chains, swinging the hammer with a vigor that would shame some men. In many iron foundries been at it all their lives. The seamstress in this coun- Lumberman.

try is, bad as her condition is made by the imported shop system, better off than her sister abroad. Women there make shirts with hand needlework for 18 cents apiece, and with the machine for 30 cents per dozen. get 36 cents a day."

Joseph Thorpe, an engineer from Murfreesborough, Ill., said that he had talked to several of the oldest engineers in England, and found them all anxious to come to America, but all declaring that they could not save enough money from their small wages to bring them here. They had for years been trying to have the American locomotive cab for the engineer and driver introduced on English roads, but as a reply to their importunities their employers had taken away their wooden seats, urging as a reason that there is less chance for a man to go to sleep while standing than while sitting. They were, however, working hard to effect an organization of the engineers, firemen, guards (brakemen), signalmen, and switchmen, and hoped that their condition would be improved soon after it was accomplished.

William Delaney, a bricklayer, said: "I saw no work in my line on the other side which compares with the work done in America. Wages are lower there.'

William T. Lewis, president of the miners' organization, said: "Wages are low abroad as compared with wages here, but the work is steadier. On the whole I think we are better off."

Edmund M. Vail, a blacksmith, thought that men of his craft in this country were doing better than those he saw in Europe. The blacksmiths abroad whom he found best off were those in Glasgow. Those in Germany, France, and Holland were far behind their English brethren.

All in the party were agreed that they had had a jolly time of it. They had been welcomed everywhere. In England they failed to run foul of the reported insular prejudice, and were entertained by members of Parliament, a live marquis, him of Ripon, and several other high dignitaries. Not one of the party had gone astray, but all were agreed that if fifty foreign workingmen were to come here on an expe dition of study, very few of them would make the return trip.

Expedition to Observe the Eclipse of the Sun, December 22.

The last session of Congress appropriated \$5,000 to defray the expenses of an expedition to be sent under direction of the Secretary of the Navy to the west coast of Africa, to observe the total eclipse of the sun on December 22. It is reported that the Pensacola will be employed for this expedition, and the preliminary details have been arranged by a board, of which Commodore John G. Walker, chief of the Bureau of Navigation; Capt. R. L. Phythian, superintendent of the Naval Observatory; Prof. Asaph Hall, of the Naval Observatory; and Prof. Simon Newcomb, superintendent of the Nautical Almanac, are members. One of the navy officers, familiar with the details, says: "Theex pedition will be divided into two parties, one of which will be under the direction of Prof. Joseph Russell, of Washington, and the other under Prof. Todd, of Amherst. The former is an expert in solar photography, and will have charge of the corps detailed to obtain photographs of the eclipse. Permission has been obtained from the Portuguese government for the expedition to land at St. Paul de Loanda, the capital of the Portuguese possessions on the west coast of Africa. The expedition will proceed from that place inland to Maxima, on the Cuanza River, where the two parties will separate and take up stations near that point, and have all of their instruments set up before the date of the eclipse. The line of the center of totality will strike the coast at a point about 100 over the stations. The expedition will not be absent probably more than three months."

New Lumbering Enterprise,

It is said that the paid-up capital of the company which is being organized in this city to tow log rafts from Puget Sound down the coast has been fixed at \$3,0,000, the greater portion of which has already been subscribed or spoken for.

The intention of the company is to erect an immense sawmill at some convenient point on the shore of the bay, the works to have a capacity for sawing out about 150,000 feet of lumber daily. The logs will be towed down by tugs from the Puget Sound forests in the shape of immense rafts, containing from 8,000,000 to tion will be reduced to a minimum.

It is claimed that there will be a saving in freight of from three to five dollars a thousand. The loss of a single raft, however, would raise the cost by a large figure. If the project can be carried out, it will mean I found women performing men's work, and some of the transfer of a large part of the lumber manufacturthem so engaged were over sixty years of age and had | ing from Puget Sound to San Francisco Bay.—Pacific

PHOTOGRAPHIC NOTES.

How to Give Paper a Porcelain Surface.—Sometimes it is desirable to give paper a hard finish, in order to prevent the image from sinking below the surface, and thus preserve the fine details of a picture. The following process, said to be practical by the Br. Jour. of Photo. and invented by Mr. Brinckerhoff, of New York, is to take a sheet of any good quality of plain Saxe, Rive, or other photographic paper coated with a warm solution of gelatine holding in suspension sulphate of barytes or finely powdered kaolin. Upon raising the paper from this emulsion it is suspended in the air until dry, when it is immersed in a solution of alum, tannin, or any other substance by which gelatine is rendered insoluble. The body of the paper is thus imbued with the gelatine and its surface has a fine texture, the pores being all filled up.

When the paper is to be used, it is salted by floating it upon a bath of chloride of ammonium and water, about four grains to the ounce of water. In this state it will keep well for many months. It is sensitized by being floated upon a bath of ammonio-nitrate of silver. An ounce of the nitrate is dissolved in sixteen ounces of water, and strong ammonia added drop by drop, with constant stirring, until the dark precipitate at first thrown down is just redissolved. Although the way here described is that by which the singularly fine specimens alluded to were prepared, yet results indistinguishable from these may be produced by sensitizing on a plain nitrate of silver solution, provided that after the paper is dry it is well fumed over ammonia, by which a great degree of richness is imparted to the tone.

After removal from the printing frame the proofs are washed first in plain water and afterward in water containing a little chloride of sodium, say a grain to the ounce. Then follow toning and fixing, the prints acquiring a fine purple in the gold bath. On removal from the hyposulphite of soda it is recommended to wash the prints in three changes of warm water, followed by a prolonged immersion in cold water.

Developing by White Light.-Mr. Charles Spiro, of this city, recently demonstrated before the Society of Amateur Photographers a successful way of developing sensitive plates without a dark room. He puts into three ounces of an ordinary single solution hydroquinone developer half an ounce of a patented inorganic dye, which imparts, in mixing with the developer, a ruby color to it. The developer thus colored is poured into a glass tray held in a small stand having a hinged cover and underneath a hinged swinging mirror. The plate, after exposure in the camera in a special double slide single plate holder, is dropped in darkness, when the plate holder is set over the glass tray, into the developer. Once in and wetted by the developer, it is safe. The holder is removed, and we see the plate perfectly plain through the ruby solution, and watch the progress of development with great ease. We have developed very satisfactory negatives in this prepared developer 6 feet from a window, 5 feet wide by 8 feet high, on which the sun was shining, with no danger of fogging. The plate has to be slightly raised from the bottom of the tray by a small stick to prevent the staining of the fingers. But the solution easily washes off. When removed from the developer it looks red, which disappears as soon as the plate is washed

There are many uses to which the improvement can be put. In testing exposures it will be valuable, since one will be able to develop in the shade of a tree or in any house a test plate to ascertain the strength of light and correct time of exposure.

In traveling, it is of particular use at hotels, where it is sometimes necessary to wait till night before a test plate can be developed. With this little adjunct it becomes a very easy matter, and, what is of great advantage, it enables one's friends to stand around a table and watch the development.

Dark Room Windows.—In the Photographic Review it is suggested that the window or the glass around a lantern be made of two sheets of ruby glass and one sheet of yellow glass. We have succeeded very well by using an orange colored glass, having interposed behind it, or in front, an orange-red curtain, something like post office paper.

Photographing on Linen or Other Fabric.—For decorating table napkins, bed room trimmings, etc., the following simple process works satisfactorily, and photographers may often do much extra business by introducing it to their customers.

Boil the fabric in water containing a little soda, so as to remove the dressing, iron smooth, and saturate

Ammonium chloride	
Water	(about 31 grains). 250 cubic cents.
White of two eggs.	(about 9 ounces).

The above are well beaten together, allowed to subside, and strained. When dry, sensitize on the usual silver bath—rather a strong bath is to be preferred expose, tone, and fix as for an ordinary print on albumen paper.-Photo. Review.

THE SEYCHELLES ISLANDS.

NICOLAS PIKE.

(Continued from page 200.)

I received an invitation from Capt. Thierry, of the French corvette Surprise, to visit Reciffe and Frigate Islands, and we steamed away on a glorious morning, and words fail me to give an idea of the loveliness of the view of these isles of the sea. We passed St. Anne's and others that are embowered in cocoanut and palm groves, and came first to Reciffe, but it is only at certain times boats can land. A whaleboat was lowered with eight men from the Surprise, two midshipmen from the Forte, and myself, to try our luck. We got close to the breakers, when we were signaled from shore to go back, and reluctantly we returned to the ship, and even that was not done without trouble from the strong current. The island is leased to a man who realizes a large profit from the sale of wild birds' eggs. Immense flocks of black gulls (Anous stolida) hover over the place, and no other birds are seen, as they resent all intrusion on their rocks, and make a deafening noise. The smell of the guano is disagreeable quite a distance off shore. The manner of procuring fresh eggs is curious. A patch on the sand is cleared from stones and old eggs, and on the following morning it is found covered with new ones, as these birds build no nest. We could see over the island, as it is almost bare of vegetation.

We then steamed to Frigate Island, which lies about 50 miles from Mahe. Schools of porpoises played round | mit of the mountain for lunch, but had numerous unthe vessel. They are smaller than the ordinary porpoise, of an olive brown, with a white stripe from head to tail, and leaped out of the water many feet in an oblique direction. They are called "cow fish" by whalemen. When about three miles from the island, we found a strong current, and one single rock just shows above the waters, which break madly round it. At a short distance from it the soundings are over 50 fathoms, so that it is probably (as I believe some of the islands are) the top of some submerged mountain of a former continent.

Very soon after we had fired a gun, we saw a large boat approaching, which contained the proprietor of the place, M. Savy, who invited us to his house, and we landed on a bold shore. Our entrance was only effected by anchoring the boat in the surf about 50 feet from the shore, when two men paid out the cable till her stern was near enough to the rock for us to leap out. We had to climb up the steep mountain side for about 300 feet, passed over the top through a few stunted trees, and descended the other side to M. Savv's house in the lowlands, shaded by magnificent banyan trees, forming long alleys of shade, impervious to the hottest sun. After doing the honors of his house most hospitably, he proceeded to show us his small but interesting domain.

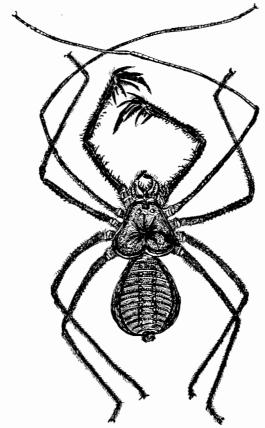
He has a distillery for rum made from the sugar canes, a fine vegetable garden, and Madagascar cattle were grazing round the place. He employed about 40 men to express the oil from cocoanuts, of which he had a large plantation. The appliances for the purpose were very rough and primitive, and by the clumsy apparatus used, half the oil was lost; £10,000 worth a year of this oil has been exported from this and other islands, but double the quantity might be produced, if proper machines were had. After seeing a good deal of the place, I began hunting about the bushes, but was warned to beware of the scorpions, and especially of a large species of spider, genus Phrynus. Frequently the bite of one of these creatures, when not promptly attended to, will cause death or long illness. Even when for a long time. The poison induces vomitings, cramps, and swellings of the whole body. The Mozambique workmen are so afraid of it, that when I came across one they ran away for dear life, and no inducement were not half as afraid of them as they are of the spiders. A large gecko is also found here, peculia r to this island and Isle Curieuse.

I here saw the very rare and beautiful bird the Pie chauteuse (Copsychus seychellarum), not long discovered by Mr. Edward Newton and his brother, and I should have liked to procure a specimen, but M. Savy was unwilling to have one shot, as this and other fine indigenous birds will soon be but memories of the past like the dodo. Cats and rats are in such formidable numbers, that the birds and other things are being rapidly destroyed. Frigate Island has but little natural vegetation, few large trees, and only here and there clumps of bushes, and is entirely of granite. We got a thorough wetting going back to the corvette, and M. Savy accompanied us, as he knew the entrance to

On the 3d of September we were off at daylight up the mountains to the northwest of Victoria. As we passed along the base we wended our way with diffi-

largest I ever saw in any part of the world. Some of This is the last stronghold of the famous coco-de-mer, them were thousands of tons in weight, luckily sufficiently apart for us to creep through them. In many places giant palms overshadowed them, showing how long they must have lain there since the time they were dislodged and toppled over from their mountain bed. In some places the people had taken advantage of the square sides of the bowlders, making them serve as one end for their houses, and, certes, they were safe on that side from hurricanes or thieves! I have seen stone broken in many countries, but here I found a novel method. I came upon a large fire of cocoa fibers, and asked for what such an amount of good fuel was being wasted. I was told, to crack the granite rocks that are so hard the ordinary drills will not pierce the great bowlders, so recourse is had to heat to split them.

At intervals we met with great bread fruit and jack trees laden with fruit, and every eye was alert to spy out the rare vegetable treasures everywhere. Once I came to a stand. I was so attracted by a tree in the distance that I shouted to my comrades, who came running up. It was indeed a rara avis-a great doubleheaded palm of the genus Hyphana, species unknown, about 50 feet high, as straight as an arrow, with a rough, spiny bark, of equal size from the collum up. The leaves, dark and long, formed two crowns divided at top and hanging gracefully all round; but it was too high for us to procure the fruit. We rested at the sum-



PHRYNUS SP.-POISONOUS SPIDER, (NATURAL SIZE,)

invited guests, for the lizards were so tame that they ran over us, and I requited their friendship by bottling some, as I caught them easily by hand. One of the most curious things to a stranger is the mason wasp that intrudes everywhere. On descending, we came upon a bowlder 15 by 30 feet and 17 feet high. It had well dressed with ammonia, it will lay the victim up fallen over three large round stones, and formed a sort of cave. Attracted by ferns and lichens at the entrance, I crawled in under the bowlder and found the whole roof covered with nests of the mason wasp. As long as I confined myself to being a spectator they left could make them help me put it in the bottle of me alone; but when I tried to detach a nest with a alcohol. I was fortunate enough to secure a number, stick I had to beat a hasty retreat, for, like bees, they though they are formidably armed with spines and combined for mutual defense. We came to a grove of claws. They belong to the "whip scorpions" (see cut) fine cacao trees (Theobroma cacao); but, although and spiders of this genus are only known from the clusters of fruit hung on every tree, the rats had ex-Seychelles, Brazils, and Lower California. I captured | tracted all the kernels. A few clove trees also flourisha few scorpions eight to nine inches long, but the men |ed, the spicy fruit scattered over the ground, and these were nearly all left of the trees imported by the French, and they were utterly neglected.

September 7. I accompanied the admiral to Praslin and others of the group. When we arrived, we had to steam round Praslin to a beautiful bay formed between it and Isle Curieuse. The peculiar rocks resembled old Druidical ruins, such as I had seen in England. We landed at Curieuse and were received by Dr. Forbes, an old Scotchman, who has been over forty years there and has charge of the leper establishment, which we visited. Small comfortable huts are erected near the sea, under the shade of palm and cocoa trees, and all were neat and clean. The greatest praise is due to the doctor, who has devoted so many years to caring for these poor outcasts. With his kind treatment and the liberality of the government all is done to alleviate the terrible sufferings that can only end in death. Even with all this there is something so loathsome in the disease I was glad to return on board.

Next morning we landed at Praslin and were received

culty between enormous blue granite bowlders, the with boundless hospitality by another Scotchman. there being very few in the other islands. On these trees are found two kinds of shells, one a very large Helix and a Cyclostoma, and never anywhere else. Grand ferns, with long waving fronds 9 to 10 feet long, waved among the granite rocks, and rare and very scarce birds were seen, and a curious large green lizard was everywhere. There is a good Episcopal church and school here. We also visited La Digue, but encountered heavy surf close inshore. Large quantities of oil are exported hence, and one man showed us a piantation of 60,000 cocoanut trees, all in full bearing. and groves of young ones coming on. A few rare birds, snakes, and a turtle peculiar to La Digue are all that are found here. On our return to Mahe we had to part from our kind friends on board the Forte, as the admiral had decided to leave at once for Grincomalee, and it was with mutual regret. I am sorry to add that this brave officer and thorough gentleman died soon after his arrival there, universally lamented.

One more mountain climb, and to say farewell to these lovely islands. We had still to ascend the Morne Blanc, the highest land in the whole group, and prepared to spend two or three days on it, taking three Mozambiques to carry our impedimenta. It was a long and sharp ascent to a plateau about half way up, where we arrived hot and tired. However, fatigue was soon forgotten, when we sat down to arrange the treasures collected, for we had snatched at everything available. Ferns, orchids, shells, reptiles, our vasculums were already overflowing. We rested that night to rally for the climb to the top. There the vegetation was sparse, but the view was magnificent, as the whole of the islands lay mapped out at our feet, in a sea calm as an inland lake and blue as sapphire, save where it combed round reefs and looked like frosted snow and ice. Our men, in spite of their loads, had climbed like monkeys, and here they reveled in the wild mandarin oranges, guavas, and other fruit, all grateful in the heat. There was a curious absence of bird life. The descent was worse than the ascent, for we had to cut our way through the rank vegetation of what is called the Black Forest. Every step had interest for us, but was not devoid of danger. In many places tons of granite had been dislodged from the peaks above, and it was not pleasant to look up at the crags and think that at any moment one of these erratic rocks might follow us. We spent two more days before returning to Victoria, and I took occasion to visit the reefs on the opposite side to Mahe, as it was my last hunt in this most interesting part of the world. I left on the 24th of September, by the mail steamer, with such pleasurable reminiscences as will last a lifetime, and treasures of all kinds.

Pains in the Head during the Growing Period.

It is a matter of common occurrence that young people of both sexes are compelled to interrupt their attendance at school on account of a cephalopathy that the author terms cephalalgia of the growing period. It commonly occurs between the ages of twelve and eighteen years, is accompanied by dizziness and malaise and is excited by any intellectual effort, sometimes even by the reading of an entertaining book. Its location is mainly in the temples, but it also involves the hairy scalp from the orbits to the mastoid processes, or even the entire head. The patient is at times irritable, easily excited, or inclined to sadness and to spells of weeping. They are wont to complain that they cannot do as their comrades do. It is a mistaken. idea to treat such persons as malingerers, and to attempt compulsory means, which cannot possibly yield good results. Together with the phenomena mentioned are also to be seen anomalies of refraction and accommodation, as myopia, hypermetropia, and astigmatism, and, in fact, diseases of the eyes in general. Proper glasses or other appropriate treatment will often lead to a rapid recovery, but such is not always the case. Additional means of treatment should be complete cessation from intellectual effort, change of air, and appropriate medication.—Rev. mens. des Mal. de l'E.; Arch. of Ped.

Barnacles.

The Ranger, U.S. N., had attached to her bottom as much as twelve tons of marine growth at her last docking in the Brooklyn navy vard, and this, too, after she had been for some time in the fresh waters of the Sacramento, in which a portion of the growth had perished. The Atlanta originally had a coating of anti-corrosive paint next to her plating, and an outside coat supposed to be proof against the attack of barnacles. On an examination of her hull, a few days since, it was found, however, that barnacles had eaten their way through the anti-corrosive paint, and had firmly attached themselves to the ship's bottom. The frequent dockings of the Atlanta and the Boston have demonstrated the costliness of keeping steel bottoms in anything like a fit condition for satisfactory speed performances, and there is an idea of sheathing them with an alloy of

RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM ACTUATED VALVE.—William L. G. Williams, Jermyn, Pa. Combined with a main valve mounted to turn and provided with an arm is an auxiliary piston operated by live steam from the cylinder and provided with a pin engaging the valve arm, with other novel features, dispensing with all outside mechanisms for operating the valve, which is automatic in its operation.

Boiler. - Isaac Hulme, Yaquina, Oregon. This is a boiler in which petroleum, coal, coal oil, etc., may be used to get up steam, and has an outer shell of a boiler and an inner shell forming a burning chamber, into which extends a water arch, a burner injecting a mixture of air and oil against the water arch in the burning chamber, flues leading from the latter to the smoke arch, and an outwardly opening valve in the smoke arch to discharge the gases into the water chamber of the outer shell.

METALLURGICAL FURNACE.—C. Peifer, Allegheny, Pa. This is a straight-draught furnace having a heating chamber terminating in a neck, over which is a stack, air spaces in the side walls of the neck extending above and below its floor line, there being below the floor line a series of cold air inlet ports, protecting the walls of the heating chamber at the neck from being cut away by the boiling slag.

IGNITOR FOR GAS ENGINES.—Isaac F. Allman, Jersey City, N. J. By this invention, a barrel connected with the interior of the gas engine cylinder is provided with slots for the passage of the igniting flame, and a plunger is held to slide in a barrel, a fixed apertured plug dividing the interior of the plunger into two compartments, one continually connected with the interior of the cylinder, and the other alternately connected with the igniting flame and the interior of the cylinder.

Railway Appliances.

CAR COUPLING.-John W. Roberts, Watford, Ontario, Canada. This coupler has a tubular drawhead, comprising a head with an opening in its bottom and a body extending rearward beneath the car, provided with a longitudinal slot and guideways upon which a link is adapted to travel, the coupler permitting uncoupling from the sides without the necessity of the operator passing between the cars.

CAR COUPLING.-John A. Dean, North Ogden, Utah Ter. In this coupling a link is employed having a continuous bore and with recessed headed ends, to be received by sockets carrying jaws arranged to enter the link head recesses, the invention dispensing with the ordinary tubes employed in the operation of steam or air brakes by making a passage through the coupling link, and the parts being so arranged that the cars may be uncoupled by throwing a lever.

Agricultural.

TRANSPLANTER. — Jacob K. Nissley, Jacob S. Mumma, and Jacob Hostetter, Florin, Pa., and Joshua W. Harris, Staunton, Va. Combined with the casing and the feed tube are hinged shovels and hinged coverers, with connecting rods having crank arms and a single operating lever, the invention being an improvement on a formerly patented transplanter, and being simple in construction and effective in operation.

SEED PLANTER AND FERTILIZER DISTRIBUTER.-Jessie A. Childs and William E. Muir, Coushatta, La. Combined with the framing of this machine are a hopper, adjustable drill boards for drilling one or two rows, and a coverer running in rear of the drill boards and having its teeth or blades adjustable, whereby to cover one or two rows, for use with fertilizer, seed, or fertilizer and seed mixed.

HAY FORK.-Joseph S. Gochnauer, East Berlin, Pa. This fork has a skeleton frame with vertical side bars and a tine pivoted to the lower end of each, a yoke or bow being pivoted within the frame and connecting rods pivoted to the bow, with other novel features, the invention being an improvement on a former patented invention of the same inventor whereby the fork may be more conveniently and positively manipulated.

Miscellaneous.

WATCH CASE PICTURE HOLDER. Gaspard Schelker, Brooklyn, N. Y. Combined with one of the outer covers or lids of the watch, having a circular offset, is a bezel sprung on the offset, and a revoluble apertured disk resting over the outer face of the cover under the bezel, whereby pictures may be held on the covers, to be covered or uncovered at will.

LEAF TURNER. - Cyril P. Brown, Spring Lake, Mich. This device has a series of arms, each with a loop at one end and a folding leaf-holding ing a double-acting catch adapted to engage the arms upon either side of the instrument, for turning the leaves of music quickly, etc.

CHECKING AND RECORDING DEVICE. --Frederick Sultzer, Yonkers, N. Y. This is a device for the automatic registering of the time when workmen or employes enter upon their duties, a frame being adjustably mounted in a case to receive a spaced and divided chart, the front of the case apertured to correspond with the chart divisions, and record attachments being arranged in connection with the case and chart.

LIVE STOCK MARKER - Andrew Casper, Argo, and Andrew Jacobson, Omaha, Neb. This marker has handles pivoted together to form jaws at their opposite ends, the outer end of one member being formed with a rectangular frame in which are held interchangeable die blocks, with stencil cutting dies of numbers or figures, for branding or marking upon the ears of cattle, etc., there being also pivoted to the frame another lever for bringing additional force on the jaws when desired.

HORSE DETACHER. - Henry J. Kenedy, Bristol, Pa. This invention provides an attachment for single and double trees whereby the traces may be disconnected from their supports, and the horses thus freed from engagement with the vehicle, the invention covering a novel construction and combination of parts.

BACK BAND HOOK.—Francis A. Yost, Paducah, Ky. This is a hook of the kind employed in connection with chain traces, and consists of a plate having an outwardly and upwardly curved and bifurcated arm forming trace-supporting loops, the arm having its upper end secured to the upper part of the plate, and provided with a tongue,

TERRET.—John T. Stoll, Sacramento, Cal. This terret is formed with an opening, whereby the strap or line may be inserted edgewise through the opening, the terret being made in the usual form in general outline and slotted, the adjacent ends of the members of the ring being in line with each other.

WAGON TONGUE SUPPORT. - Robert Lynn, Sr., Brighton, Iowa, This invention covers a novel application of a spring and socket plates to hold up the tongue and relieve the horses of its weight, the device being simple and cheap, and one which can be readily applied by a farmer or other user to an ordinary wagon, without the aid of a skilled workman.

BABY CARRIAGE.—Rodolph McMakin. New Albany, Ind. By this invention the front axle is pivotally connected with the carriage body, and a propelling and guiding bar extends rearward from the front axle, and is provided with a handle for pushing and directing the carriage, which can be done without using the handle as a lever to pry or twist the carriage to either side.

DISH DRIER.—Alice J. Wilson, Abilene, Texas. This is a novel form of covered vessel, with a false bottom and perforated top, in which the dishes are to be placed after washing, and hot water poured over them, the steam passing off through the perforations of the cover, and the dishes being dried by their own heat without wiping.

GAS STOVE. - James Gibbons, Jersey City, N. J. This is a stove with an inner base and burner and a fire pot with surrounding drums for superheating air passing to the burner and for the escape of hot air to the room, being designed for the combustion of fluid fuel, such as coal or water gases, and to effect the work so perfectly as not to vitiate the air of a room in which the stove may be placed.

CLOTHES LINE HOLDER.—Henry A. Denman, Brooklyn, N.Y. This is a holder for use in windows, and has two bars adapted to slide upon each other and carrying a hook adapted to receive the clothes line pulley, a clamp for locking the bars when extended and spurs to prevent the displacement of the bars when adjusted in a window.

HAMMOCK AND SEAT SUPPORT. Joseph J. Johnson, Dayton, O. This is a support which can be readily moved from place to place, and consists of a supporting wire or cable, a frame carrying wheels which ride upon the cable, the frame having hammock-supporting hooks and a seat, with means for driving one of the wheels.

EARTH CLOSET COMMODE. - John W. Stowell, Putney, Vt. This invention relates to an article of household furniture combining a commode and an earth closet in a manner designed not to indicate the presence of the closet when the structure is folded or closed.

CONSTRUCTION OF ARCHES. - James Bogert, Yonkers, N. Y. Combined with uprights, and girders uniting them, are diagonal brace plates secured to the uprights and girders, and anchors secured to the brace plates, girders, and uprights, with other novel features, whereby memorial arches, etc., may be built in a simple, expeditious, durable, and economical manner, in an open space, and stand firmly without the aid of abutments or tie rods.

RUNNING GEAR FOR VEHICLES. Charles A. Blume and Francis N. Armstrong, Colfax, Ind. This invention relates to vehicles having their wheels mounted on pivoted axle arms arranged to be operated by the pole or shafts in turning, the gear being in all its parts a combination of T steel, angle steel, bar steel, gas pipe, and malleable iron, and running easily, permitting the vehicle to turn in a very small

DERRICK. - William E. Chapman, Brooklyn, N. Y. This invention provides a derrick applicable for use in the raising of extremely heavy weights, it being so constructed that, in use upon a float, the weight is brought beneath the apex of the supporting frame and above the center line or keel, maintaining the equilibrium of the derrick, this derrick having been employed to raise sunken vessels bodily.

Brick Machine.—Gustavus Van fork at the opposite end, with a support for the loops, and Deventer, Matawan, N. J. In this machine the under a key pivoted to the center of the instrument and carry- or bottom side of the plunger is formed with its outer edge depressed or at a lower level than the opposite edge next the mixer, to exert a great pressure at the outside edge of the mould, where the clay is liable to scant, than at the side next the mixer, where the clay is more or less compressed and fills the full capacity of the aperture to the press box.

> BRICK MOULD SANDING MACHINE George E. Smith, Kingston, N. Y. Combined with a supporting frame is a rotary sand box a disk provided with pins being mounted on the shaft of the box, and a lever pivoted to one side of the frame connected with a forked lever engaging the pins of the disk, with other novel features, whereby the moulds may be regularly fed forward to the press and will at the same time be effectively sanded.

BARREL HOOPING MACHINE. - Frank Glankler and William W. Simmons. Memphis. Tenn. This invention provides a machine for trussing or squeezing together the ends of a barrel, and in the all newsdealers. same operation forcing upon the barrel the end hoop with the same advance motion which trusses the barrel.

GRINDSTONE TOOL HOLDER. - Alexander H. Dick, Cramer's Hill, N. J. This is a device in which a bed plate is made to support the handle end of the tool, a weighted arm being pivoted on the bed plate and provided with a clamp engaging the tool blade, the device being simple in construction and designed to automatically hold the tool in any desired position on the grindstone.

LANTERN. – Ole Handeland, Fort Sisseton, Dakota Ter. This is a lantern specially designed to be fastened on a horse's back, its holder comprising a casing having a transparent slide in its front and a flange on its bottom, and a saddle with a platform having a marginal guideway to receive the flange of the bottom of the casing, the arrangement being such that the wind cannot extinguish the light.

TURFING IMPLEMENT. — Melville C. Ayer, Biddeford, Me. This invention covers an improved feeding device for turfing or rug machines, serving for automatically feeding the machine forward, and being very simple and durable in construction and very effective in operation.

SCIENTIFIC AMERICAN

BUILDING EDITION.

OCTOBER NUMBER.-(No. 48.)

TABLE OF CONTENTS.

- 1. Elegant plate in colors of a residence at Montclair, N. J. Perspective elevation, floor plans, sheet of details, etc. Messrs. Munn & Co. architects.
- 2. Plate in colors showing a two story and attic frame dwelling at Montclair, New Jersey, at a cost of five thousand dollars. Mesers, Munn & Co. architects. New York. Perspective, floor plans, shee
- 3. Design for a memorial monument at the Langside battlefield. A. Skerring, I.A., architect.
- 4. Engraving of the Winn memorial public library, Woburn, Mass. H. H. Richardson, architect.
- 5. A cottage at Mt. Vernon, N. Y., costing four thousand five hundred dollars. Perspective view and floor plans.
- 6. Residence erected at Mt. Vernon, N. Y., by the Hon. Chas. Crary, at a cost of eight thousand dollars. Plans and perspective elevation.
- 7. Design for a three thousand dollar railway station. Drawn by Mr. W. Henderson, of the Chicago Architectural Sketch Club.
- 8. A residence at Bridgeport, Conn., built for I. W. Birdsey, Esq., at a cost of eleven thousand seven hundred dollars. J. W. Northrup, architect.
- A residence at Chester Hill, Mt. Vernon, N. Y. recently erected for I. J. Smith, Esq., at a cost of twelve thousand dollars. Floor plans and perspective elevation.
- 10. A stone house on Jersey City Heights, N. J., built in 1812, and recently remodeled by L. H. Broome, Esq. Perspective elevation and plans,
- A block of brick fronts at Bridgeport, Conn., W. H. Worsam, architect. Cost three thousand six hundred dollars each. Floor plans and perspective elevations.
- 12. New court house and post office, New Bedford, Mass. Perspective and plans.
- 13. The Mexican pavilion at the Paris expositionhalf page engraving.
- 14. A residence on Jersey City Heights, N. J., built for G. W. Patten, Esq. Plans and perspective.
- 15. A colonial house at Englewood, N. J. Edward H. Kendall, architect, New York. Perspective and floor plans.
- 16. Sketch of Florence Nightingale's home at Lea Hurst,
- 17. House on Grayswood Hill, Haslemere. Perspective and plans.
- 18. Sketch of the Fitzwilliam museum, Cambridge, Half page engraving.
- Entrance doorway to the ceramic and mosaic sec tion, Paris exposition.
- 20. Bedroom of the Shah of Persia, in the Hotel de la Rue Copernic, Paris. Miscellaneous Contents: An acoustic trouble.
 - Evils of large drain pipes.-The giant redwoods. -Use of dynamite in making foundations.- ${\bf Cement \ \, for \ \, stone. - Ornament. - Cypress. - A}$ talk with a quarryman.-Slate an unsafe roofing for mills,-Memorial pulpits, illustrated.-An ornamental chimney, illustrated .- Planting strawberries.-The camera as a witness in a suit for damages.-Extensive and successful trusts: the co-operative building system.—A model bedroom. -The painter and the architect. - Woods for finishing. - An improved wood finish for in-

illustrated. — Decoration of interiors

with "Lignomur," illustrated .- A substitute for

glass.-Artistic surroundings enhance morals.-

An improved woodworking machine, illustrated

The Scientific American Architects and Builders Edition is issued monthly. \$2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITEC TURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

-House heating.—The homes of the poor.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural publication in the world. Sold by

> MUNN & CO., PUBLISHERS. 361 Broadway, New York.

Business and Personal.

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

All books, app., etc., cheap. School of Electricity, N.Y.

Ash sifter patent for sale. See page 210.

Wire Rope Tramways for the economical transportation of ores and other materials. Quarry hoists. Wire rope of all kinds. The Trenton Iron Company, Trenton, N. J. New York office, Cooper, Hewitt & Co., 17 Burling Slip. Western agents, Fraser & Chalmers, Chicago, Ill.

For best hoisting engine. J.S. Mundy, Newark, N.J.

Eureka Cotton Machine Belting.

A cheap and perfect substitute for leather or rubber belting. Address Eureka Fire Hose Co., 13 Barclay St., New York, for prices and samples.

Automaton Wanted—Any new and novel mechanical figure-either working drawing, rough model, or comprice will be paid. Address Key, 94 Liberty St., 3d floor.

The Little Falls (N. Y.) Water Company in testing all the popular water motors have adopted those made by the Tuerk Hydraulic Power Company. Address No. 12 Cortlandt St., New York.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

For the latest improved diamond prospecting drills,

ddress the M. C. Bullock Mfg. Co., Chicago, Ill. Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J

The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

Screw machines, milling machines, and drill presses. E. E. Garvin & Co., Laight and Canal Streets, New York.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Hoisting Engines, Friction Clutch Pulleys, Cut-off Couplings. The D. Frisbie Co., 112 Liberty St., N. Y.

Tight and Slack Barrel Machinery a specialty. John Freenwood & Co., Rochester, N.Y. See illus. adv., p. 178. Band saws, with tipping table. All kinds woodwork-

ng machinery. Rollstone Machine Co., Fitchburg, Mass. Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.



HINTS TO CORRESPONDENTS.

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

References to former articles or answers should

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.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

to may be had at the office. Price 10 cents each. **Books** referred to promptly supplied on receipt of

Minerals sent for examination should be distinctly marked or labeled.

(1340) T. S. W. writes for a practical rule for finding the length of a chord between the centers of two holes to be laid off on a circle of any diameter. For instance, I want to lay off eight holes on a circle ten inches in diameter. What will be the length of the chord between two consecutive holes? I want a rule that I can use without a protractor? A. No general rule can be given. By the square you can divide a circle into four parts; by using the radius as a chord, you can divide it into six parts. Other divisions can be made by the use of the dividers, starting with the full circle or using the division into four or six parts as a basis.

(1341) E. J. F. asks: How to make an ink that will copy without the use of press, brush, or water. A. Dissolve an aniline color in water, and add a little glycerine. It is well to dissolve the color in alcohol first. About 10 per cent of glycerine should

(1342) J. F. D. asks for a cheap white enamel or flexible veneering, to coat pasteboard, to strengthen and to thicken it. A. Paper is enameled by coating with a mixture of 100 parts kaolin (perfectly dry) and 24 parts paraffin melted and mixed hot. After cooling it is reduced to powder and worked intopaste in a paint mill with water, and then applied to the paper. Or try a mixture of dammar varnish and Chinese white. The last will strengthen the paper a little; the first will not.

(1343) J. M. M. asks for the method of cleaning and polishing clam shells. A. Clean with a rag dipped in hydrochloric acid, wash in warm water, dry in sawdust, and polish with chamois leather. If the shell is too dull, varnish, or else rub with a little tripoli powder and turpentine on wash leather; then with fine tripou alone, and with olive oil, finally rubbing up with a chamois. Boiling in lye is sometimes resorted to, and the shells polished on wheels.

(1344) E. B. B. writes: 1. Can you refer me to a work that treats thoroughly on valve setting? A. We can supply you Rose's Slide Valve for \$1 by mail. 2. Also inform me the process it is necessary to go through to find the weight of a cubic foot of air. A. At standard temperature and pressure one cubic foot of air weighs 53696 grains, or 1-816 of the weight of the same volume of water. It has been determined

by weighing a vessel of known volume, first exhausted and ther full of air the difference of weights representing the weight of air contained,

(1345) J. P. asks for (1) the receipt for making red fire. A. Mix 9 parts nitrate of strontium; 3 parts powdered sheilac, and 11/2 parts chlorate of potash. 2. Also for making quick match composition. A. Quick match composition is made of 4 parts saltpeter, 2 of gunpowder, 2 of charcoal, and 1 of sul-

(1346) R. R. C. asks if commutator for 8 light dynamo as described in Supplement, No. 600, could not be made by having 24 strips of sheet copper and 24 strips of glass affixed to a small cylinder of wood by shellac on under side, and wound with varnished string on ends of cylinder to hold strips in place, and to have small screws in end of copper strips to connect with armature wire, strips of copper and glass to be one thirty-second or one-eighth inch thick, whichever would be the best; the small spaces between glass and copper to be filled with shellac to prevent dust from filling in. A. Your form of commutator is objectionable on account of the wide spaces between the copper bars, also on account of the shellac filling. Better place bars one thirty-second inch apart and either have air spaces or fill the spaces with strips of mica. Probably your winding of cord and the varnish would hold the copper bars. You might make slits in the wood with a thin saw for the mica.

(1347) R. R. N. writes: Would you name a fluid that is not very heavy, and is a good conductor for electricity? A. No such fluid is known. A solution of sulphuric acid of specific gravity 1.215 has one of the lowest resistances of aqueous fluids, but it is 500,000 times greater than that of silver.

(1348) G. W. W. S. asks: 1. About how many one gallon cells of gravity battery would be re quired to run an Edison six candle power incandescent lamp, which requires 1.40 amperes of current, I am well aware of the fact that this style of battery is not suitable for this purpose, but I thought that if I would connect enough cells together, I could produce current enough to run a lamp of the size named above. If I could succeed in running the lamp with gravity battery, about how long would it last without having to be replenished? (I mean the battery.) Which would be the best way for me to connect the cells, in parallel or in series? Also please inform me how to connect in parallel. A. Owing to the internal resistance of the gravity battery and its comparatively small E. M. F., it would require about 180 cells to run your These should be connected 15 in series with 12 series in parallel. It would run for several months. 2. If this battery cannot be used, how many cells of the new compound Fuller battery would be required, and about what length of time would it run the lamp without being recharged? A. It would require about 40 cells of Fuller battery connected 8 in series with 5 series in parallel. It would probably run for a week.

(1349) C. C.—See answer to G. W. W. S. on this page in regard to primary batteries for electric lighting. The secondary battery referred to can be charged by means of a primary battery, but it is a tedious process which does not pay.

(1350) W. O. G. writes: 1. I see frequently in the papers that in the oil regions closed naphtha tanks are exploded by being struck by electricity. I had supposed that to explode naphtha it was necessary to have it exposed to the atmosphere. Please tell me if I am right. A. The tanks are struck by lightning and ruptured and the naphtha ignited, or it may be that some leakage is set on fire by lightning. The naphtha in a tightly closed tank will not be affected. 2. Will you also give the chemical formula of naphtha distilled from petroleum oil? A. It varies widely, consisting for the most part of paraffines [of the series CnH(2n+2)] and olefines (of the series CnH2n).

(1351) J. C. asks: 1. What kerosene oil is composed of? A. It is composed principally of hydrocarbons of different series (see preceding query). 2. What is the cause of that blue light around the base of the light? And what is the cause of the same reason in the candle? A. The blue light is due to combustion at a comparatively low temperature, probably of carbonic oxide gas. A. How to melt coal? A. Bituminous coal undergoes a partial fusion when heated in a closed vessel. 4. How to make sodium. A. For manufacture of sodium we refer you to any chemistry

(1352) D. S. H. asks for a recipe for making wine or cordial from common rhubarb (large variety). Rinse gently 40 pounds of best quality rhubarb stalks in a 15 or 20 gallon tub. Add 4 gallons of water, stir and squeeze the $\,{\rm pulp}$ with the hands so as to separate the juice. Let it rest for a few hours, strain, and press through a coarse cloth. The residue may have one gallon more of water pressed through it. Add 30 pounds loaf sugar and after its solution water to make it up to 101/2 gallons. Put it in a tub covered with moved this has to be renewed, which requires experia blanket and some boards at 55° to 60° Fah. until it egins to ferment. Then put into a cask a portion at a time, as its working decreases until all is in. Let the scum as it works run out of the bung hole. When nearly through fermenting drive the bung, but in a spile, which is to be removed every few days until the barrel is safe from bursting. Use more or less sugar ac cording to the strength and sweetness desired.

(1353) N. G.-There is nothing better than good clear pine or cedar for a model yacht. Block it out roughly inside and outside. Keep it out of the sun and it will not crack. When finished oil thoroughly inside and outside with raw linseed oil and let it dry for a number of days (not in the sun). See a book "Hints to Beginners in Amateur Yacht Designing." by Biddle, which we mail for \$1, or "Model Yachts and Boats" by Grosvenor, a larger book, 121 designs and working diagrams, \$2 mailed.

(1354) W. V. S. writes: I wish to construct a solenoid to exert a pull of 5 pounds in its core with a 100 volt current. What size and length of wire should I use and what current would it require? A. Your potential is exceedingly high. The solenoid which would be manageable at such a potential would have very high power. Make a solenoid of No. 20 wire.

using about 100 feet, and introduce it in shunt with a resistance in the other branch of one-tenth ohm. This you can get from a piece of lamp carbon, uncoated, 16 inch diameter and 12 inches long. Your best plan is to put in a longer piece of carbon with a sliding contact, connect your coil, and slide the contact along until proper power is attained. If you have to pay for all the current, this method is, of course, very uneconomical.

(1355) On. & Co. ask: What material s good for a lining of a wooden lye tank so that the strong lye cannot leak through the wood joints, as the lye does so through the most watertight joints of wood materials? A. Use following compos. I on on all leaking points: Burgundy pitch 150 parts, gutta percha in shreds 25 parts, powdered pumice stone 75 parts. Melt together first the gutta percha and pumice stone and when well mixed add the Burgundy pitch. Use a hot soldering iron or poker to melt it in with. The drier the tank, the better will be the result. It is well to try it on a small scale, and if satisfactory to coat the entir tank with it.

(1356) M. A. C. writes for the process of crystallizing tin for covering trunks. A. Hold the plate slightly heated over a tub of water and rub its surface with a clear solution of 4 parts nitric acid, 2 distilled water, and 1 salt or sal ammoniac. When the figure is well developed dip and washit off carefully, so as not to disturb the figure, dry at low heat, and lacquer Or just as a plate is leaving the tin bath in the regular tinning process, if cold air is blown upon it as the tin solidifies, a similar result will be attained. Tin plate for covering trunks is frequently given relief designs by passing it between engraved rollers.

(1357) T. J. asks: 1. Are there any metals which when used as contact points, dipping i mercury, will not be injured by amalgamating? A. Use platinum or steel. 2. In case of alloy would the mer cury be injured for use in an air pump? A. Yes; it will be injured for such use. 3. Will the passage of electric current or heat generated when contact is broken prevent or correct alloy? A. It will not.

(1358) J. B. writes: What can I use in the shape of an iron perforated pipe to assist combustion in a fire box? Would common iron pipe burn up if a current of air at 110° was kept passing through it over a hot fire? If so, tell me what I can substitute for iron pipe. A. Extra strong wrought iron pipe will last several months, as an air pipe in a furnace, if it can be kept below red heat. Heavy cast iron rectangular pipe partially built into the brick work is also used for hot air jets for perfecting combustion. Hollow fire brick tile has also been tried. We cannot give reliable advice without knowing exactly what you wish to accomplish. There has been much experimenting for perfecting combustion in boiler and other furnaces, with but indifferent results,

(1359) J. R. T.—There is no way of indicating water veins or anything else beneath the earth with a forked stick. You cannot prevent the taste of clay in water that lies upon a clay stratum. A pipe drain through the clay may strike a water vein below of purer quality.

(1360) J. W. writes (1) for a receipt to enamel wood (black). A. The best plan is to have it japanned. Varnish may be mixed with the paint or several coats may be applied, and each in turn rubbed down with pumice and water, and after varnishing several times with similar rubbings down the last coat may be polished with rotten stone and oil. 2. Can porcelain be dissolved into a thin liquid by acids? A. No.

(1361) E. H. N., M.D., asks if repeated boiling of surgical cutting instruments (in water) will affect their temper. A. No. The temperature of boiling water is too far below that at which the instruments were tempered for any effect by boiling upor their cutting qualities.

(1362) W. M. A. asks: Do you consider the valve motion commonly used on locomotives a direct valve motion? A. Yes; a directivalve motion. The shifting or stationary link does not change the direct action of the eccentric. The old rock shaft valve gear was an indirect valve motion.

(1363) G. W. H. asks: For forcing draught in furnace on steamboat, is a blower run by separate engine more economical than steam jet in smoke stack? If it is, please state reasons. A. This is not yet a settled point in steam making. With a small boiler the jet, if of best form, is probably the most economi-There is more economy in making the boiler large enough to give sufficient steam without jet or

(1364) J. H. L.—We do not recommend any attempt to repolish a theodolite, except it be in the hands of an instrument maker. Carefully and thoroughly clean off dirt from the surface. The instrument has a coat of lacquer that protects the surface and if reeuce in instrument work. Generally the best polish for brass is rotten stone and

(1365) G. G. M.—The great telescope of Lord Rosse has a speculum 6 feet diameter, 55 feet focus. It is still in use.

(1366) E. S. asks: How is chipped glass made? It has a feather or frost like appearance. A It is made in several ways. The following is one method: The body of the vessel is coated with an other kind of glass and while hot is cracked by application of water. Then it is partly remelted.

(1367) E. H. B. asks: Will you kindly answer through your paper, how to thin mucilage? I use a sponge top bottle, and the mucilage is so thick it does not come through easily. A. Thin mucilage with water. To clear the sponge, place some water in a saucer and press the sponge down repeatedly in it.

(1368) W. A. T. asks how to color the brown streaks black on buffalo horns, after they have been polished? A. Apply a dilute solution of nitrate of silver with a brush or rag several times, until the desired intensity is obtained. Allow it after each appli cation to dry in the sun perfectly before applying the next coat. Polish when sufficiently black.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the iaws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

September 17, 1889,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Advertising and street announcing apparatus,	Dye, blue, D. E. Huguenin 411,149
McKenzie & Miller	Electric conductors, pole for supporting, S. H. Short
Advertising device or coin protector, E. W. Park-	Electric cords, terminal plug attachment for
er	flexible, S. C. Lafferty
Air heater, L. Hussey	Electric generation and distribution for railway cars, system of, E. E. Ries
Alcoholic liquids, manufacture of, J. Takamine. 411,231	Electric light shade holder, H. H. Sawyer 411,39
Animai trap, H. E. Kelley 411,039, 411,246, 411,247	Electric meter, H. W. Kolle
Annunciator, electric polarized, C. E. Scribner 411,133	Electric motor and blower, combined, C. J. Hirli-
Anvil, horseshoe, L. E. Wescott	mann. 411,03 Electromotor, A. S. Kissell. 411,15
Arches, construction of, J. Bogert	Elevator. See Sawdust elevator.
Axle boxes, dust guard for car, C. W. Hayes 411,100	Elevator lock, E. E. Angell
Ballot, envelope, J. R. Gathright 411,142	Engine. See Gas engine. Pulp beating engine.
Bar. See Grate bar.	Pumping engine.
Barber shop indicator, Dudley & Cosby	Envelope damping machine, H. J. H. Schuett 411,355 Evaporating apparatus, A. Chapman 411,01
Barrel making machine, L. M. Reed 411,360	Evaporating apparatus, vacuum, A. Chapman 411,011
Barrels, combined cover and pump for oil, L. J.	Explosives, producing high, H. Maxim 411,12
Spangler 411,358	Extractor. See Bung extractor.
Bating, A. Hull	Eyeglass nose pad, J. P. Molitor
Battery. See Galvanic battery. Battery connector, secondary, S. H. Barrett 411,370	Fabric. See Pile fabric. Fan blades, attachment for rotary, D. Whitlock 411,31
Battery connector, secondary, S. H. Barrett 411,310 Battery receptacle, secondary, F. W. Huestis 411,124	Farm gate, B. L. Zimmerman
Bean cutter, C. Bruemmer	Fastener for envelopes, boxes, etc., P. J. Miller 411,04
Bed, camp, J. Dick	Faucet, sirup, E. Haas 411,02
Bed, spring, B. E. Leckron	Fence machine, Young & Watts
Beer, means for boiling, cooling, etc., Hoffman &	Fence machine tension device, Forsythe & Gwinn 411,12
Ebert	Fence post, clay, W. H. Heindel
Bell mechanism, door, A. F. Rockwell	W. W. Hightree
Bell ringer, automatic, Riesenberg & O'Hearne 411,129	Fire curtain, H. G. Miller 411,16
Block. See Tackle block.	Fire escape, A. W. Lennier 411,10
Board. See Game board.	Fire extinguishing apparatus, C. B. Harris 411.19
Boiler. See Steam boiler.	Fire lighter, W. Harles
Boiler, J. Lapp. 411,223 Boiler, J. Lapp. 411,249	Fireplace and open grate, ventilating, H. P. K. Peck
Boiler or other furnace, steam, J. H. Annandale 411,084	Flue scraper, boiler, W. T. Coggeshall 411,32
Bolt, E. Anderson	Foot warmer, Blosfeld & Schnur 411,18
Bolt blank forming machine, W. E. Ward (r) 11,030	Fork. Hay fork.
Bolt threading machine, J. A. Becher	Fruit gatherer, C. J. Bloom
Ward	Furnace. See Boiler or other furnace. Metal-
Boot, C. C. Houghton	Jurgical furnace.
Boring machine, multiple, C. A. Stark 411,359	Furnaces, condensing fumes from metallurgic, F.
Bottle or similar article, Leuchs & Meiser 411,157	P. Dewey
Bottle stopper, T. J. Cain 411,277 Bottle wrapper, C. G. Biedinger 411,371	Furnaces, hydrocarbon burner for, A. Lentz 411,38
Bottles, means for capping and sealing milk, H.	Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge
P. & S. L. Barnhart	Galvanic battery, W. C. Thompson 411,40
Box. See Paper box.	Game apparatus, M. Virnoche 411,40
Brakes, pipe connection for pneumatic, L. Blatt 411,006	Game board or apparatus, C. Gooch
Breech loading small arm, P. T. Gadsal	Gas, apparatus for the manufacture of, V. L. Elbert
Brewing ale, beer, and porter, L. Frisch	Gas burners, heating attachment for, C. Long 411,12
Brick machine, J. W. & R. C. Penfield 411,296	Gas engine, igniter for, I. F. Allman
Brick mould sanding machine, G. E. Smith 411,228	Gas, process of and apparatus for manufacturing,
Brick, paving, H. B. Camp 411,010	Morse & Springer 411,38
Brush block boring machine, C. A. Mahle 411,346	Gas regulator, W. C. Rossney
Buckle, backband, W. A. Marsh	Gate. See Farm gate. Glassware, apparatus for reheating, H. Schulze-
Bung, M. Delker	Berge 411,13
Bung extractor, O. Winkler 411,179	Glassware, furnace for heating, H. Schulze-Berge 411,13
Burner. See Hydrocarbon burner.	Governor, S. Quast
Calendar, R. A. Robinson	Grain binder, G. Greenlee, Jr
Banta	Grain mill safety device, L. Wagner
Can. See Shipping can.	Grain separator, J. Payer
Car coupling, W. H. Burwell 411,236	Grate, W. J. Owens 411.39
Car coupling, J. A. Dean	Grate bar, E. J. Gordon 411,37
Car coupling, M. J. Lorraine 411,289 Car coupling, J. W. Roberts 411,227	Grate or fireplace front, J. M. Seymour
Car coupling, W. C. Watson	Grinder, roll, P. F. Dooley 411,09
Car door, E. L. Phipps	Grindstone tool holder, A. H. Dick
Car for testing railway track scales, weighing, S.	Gun, transportable or field, M. Dreger 411,32
M. Taylor	Gutta-percha, substitute for, C. A. A. H. Siebert. 411,17
Car, railway stock, J. H. Kimball	Hair curling and crimping device, I. W. Hey- singer
Car, stock, S. P. Tallman	Harmonica holder, A. B. Clark
Car wheel, J. Rigby 411,354	Harness loop, S. W. Shirk 411,35
Car wheel grinder, P. H. Griffin 411,244	Harrow, A. Callander 411,00
Car wheels, thrust receiving plate for, S. W. Tan-	Harrow, C. La Dow. 411,19
ner	Harrow, disk, M. Daley
411,016, 411,020	Hasp lock, E. Knight
Carbonizing flask, T. A. Edison 411,617	Hat and coat holder, T. J. Manning 411,38
Carboy stand, J. F. Stevenson	Hat sweat and lining, detachable, F. W. Lewis 411,15
Card cylinder, K. L. Krausse	Hay fork, J. S. Gochnauer 411,22
Card stamping machine for Jacquard machines, W. P. Uhlinger	
Carding machine, G. A. Allison	Head protector, H. G. Morrow 411,34
Carpet stretcher and tack driver combined, S. L.	Head protector, H. G. Morrow
Troupe	Head protector, H. G. Morrow
Troupe	Head protector, H. G. Morrow
Troupe 411,270 Cart, road, J. G. Gay 411,284 Cart, road, J. W. Vorwick 411,114	Head protector, H. G. Morrow
Troupe. 411,270 Cart, road, J. G. Gay. 411,284 Cart, road, J. W. Vorwick 411,114 Cash carrier apparatus, pneumatic, J. L. Given. 411,334	Head protector, H. G. Morrow
Troupe 411,270 Cart, road, J. G. Gay 411,284 Cart, road, J. W. Vorwick 411,114	Head protector, H. G. Morrow
Troupe	Head protector, H. G. Morrow
Troupe.	Head protector, H. G. Morrow
Troupe. 411,270 Cart, road, J. G. Gay. 411,284 Cart, road, J. W. Vorwick. 411,114 Cash carrier apparatus, pneumatic, J. L. Given. 411,334 Caster, E. Barron. 411,181 Cereals, scouring and decorticating, W. Ager. 411,316 Chain link, I. Brown. 411,321 Chair. See Railway chair. Chill, contracting, J. N. Barr. 411,369	Head protector, H. G. Morrow
Troupe.	Head protector, H. G. Morrow
Troupe.	Head protector, H. G. Morrow
Troupe.	Head protector, H. G. Morrow
Troupe	Head protector, H. G. Morrow
Troupe	Head protector, H. G. Morrow
Troupe	Head protector, H. G. Morrow

Coaster, J. P. Newburg
Collar fastener, horse. J. T. Roundtree 411,110
Collar fastening, horse, P. T. Bradley
Combing machine, wool, D. P. Norris
Cooking edibles, H. Fricker
Corn and fertilizer dropper, J. P. Birmingham 411,005 Cotton chopping machine, Huguley & Chambers,
Jr
C. Potter
Coupling. See Car coupling. Stovepipe coup-
ling. Cover for cooking vessels, Crosby & Cook 411,185
Cream separator, centrifugal, S. Jonsson 411,038
Crocheting machine, G. D. Munsing
Mahle
Cutt-out, F. G. A. Heller
Defecting pan, M. Swenson
Digger. See Post hole digger.
Distilling crude petroleum, apparatus for, W. H. Pitt
Dough raising tray, B. Z. Dampierre
Drying or evaporating apparatus, J. B. Seaman 411,397
Dye. blue, D. E. Huguenin
Short
flexible, S. C.: Lafferty 411,153
Electric generation and distribution for railway cars, system of, E. E. Ries
Electric light shade holder, H. H. Sawyer
Electric motor and blower, combined, C. J. Hirli-
mann. 411,030 Electromotor, A. S. Kissell 411,150
Elevator. See Sawdust elevator.
Elevator lock, E. E. Angell
Pumping engine. Envelope damping machine, H. J. H. Schuett 411,355
Evaporating apparatus, A. Chapman
Explosives, producing high, H. Maxim
Extractor. See Bung extractor. Eyeglass nose pad, J. P. Molitor
Fabric. See Pile fabric.
Fan blades, attachment for rotary, D. Whitlock. 411,512 Farm gate, B. L. Zimmerman 411,083
Fastener for envelopes, boxes, etc., P. J. Miller 411,045 Faucet, sirup, E. Haas 411,026
Fence machine, Young & Watts 411,365
Fence machine tension device, Forsythe & Gwinn 411,122 Fence post, clay, W. H. Heindel
Fences, tension machine for use in constructing, W. W. Hightree
Fire curtain, H. G. Miller 411,163
Fire escape, A. W. Lennier
Fire lighter, W. Harles
Peck
Peck
Peck 411,333 Flue scraper, boiler, W. T. Coggeshall 411,324 Foot warmer, Blosfeld & Schnur 411,182 Fork. Hav fork. 412,182
Peck. 411,393 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware. 411,311
Peck
Peck. 411,333 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F.
Peck. 411,333 Flue scraper, boiler, W. T. Coggeshall. 411,334 Foot warmer, Blosfeld & Schnur. 411,152 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware. 411,311 Furnace. See Boiler or other furnace. Metal- Jurgical furnace.
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,152 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware. 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C.
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,822 Fork. Hay fork. 411,182 Fork. Hay fork. 411,007 Fuel controller, thermostatic, E. R. Ware. 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,243 Galvanic battery, W. C. Thompson. 411,400
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,52 Fork. Hay fork. 411,162 Fork. Hay fork. 411,162 Furl gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware. 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,243 Galvanic battery, W. C. Thompson. 411,400 Game apparatus, M. Virnoche. 411,402
Peck
Peck. 411,393 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,423 Galvanic battery, W. C. Thompson 411,400 Game apparatus, M. Virnoche. 411,402 Game board or apparatus, C. Gooch. 411,221 Gas, apparatus for the manufacture of, V. L. Elbert. 411,022 Gas burners, heating attachment for, C. Long. 411,135
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,152 Fork. Hay fork. 411,152 Fork. Hay fork. 411,007 Fuel controller, thermostatic, E. R. Ware. 411,017 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,243 Galvanic battery, W. C. Thompson 411,400 Game apparatus, M. Virnoche. 411,402 Game board or apparatus, C. Gooch 411,221 Gas, apparatus for the manufacture of, V. L. Elbert. 411,022
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,423 Galvanic battery, W. C. Thompson 411,400 Game apparatus, M. Virnoche. 411,402 Game board or apparatus, C. Gooch 411,221 Gas, apparatus for the manufacture of, V. L. Elbert. 411,022 Gas burners, heating attachment for, C. Long. 411,123 Gas engine, igniter for, I. F. Allman 411,211 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,389
Peck
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,243 Galvanic battery, W. C. Thompson 411,400 Game apparatus, M. Virnoche. 411,402 Game apparatus for the manufacture of, V. L. Elbert. 411,022 Gas burners, heating attachment for, C. Long. 411,124 Gas process of and apparatus for manufacturing, Gas regulator, W. C. Rossney. 411,062, 411,063
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,152 Fork. Hay fork. 411,007 Fuel controller, thermostatic, E. R. Ware. 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,243 Galvanic battery, W. C. Thompson. 411,400 Game apparatus, M. Virnoche. 411,402 Game board or apparatus, C. Gooch. 411,221 Gas, apparatus for the manufacture of, V. L. Elbert. 411,022 Gas burners, heating attachment for, C. Long. 411,124 Gas engine, igniter for, I. F. Allman. 411,211 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,389 Gas regulator, W. C. Rossney. 411,062, 411,063 Gate. See Farm gate. Glassware, apparatus for reheating, H. Schulze-Berge. 411,333 Glassware, furnace for heating, H. Schulze-Berge. 411,331
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,243 Galvanic battery, W. C. Thompson 411,402 Game apparatus, M. Virnoche. 411,402 Game apparatus for the manufacture of, V. L. Elbert. 411,022 Gas, apparatus for the manufacture of, V. L. Gas burners, heating attachment for, C. Long. 411,124 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,359 Gas regulator, W. C. Rossney. 411,062, 411,063 Gate. See Farm gate. Glassware, apparatus for reheating, H. Schulze- Berge. 411,132 Glassware, furnace for heating, H. Schulze- Berge. 411,135 Governor, S. Quast. 411,056 Grain binder, G. Greenlee, Jr. 411,025
Peck
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,243 Galvanic battery, W. C. Thompson 411,400 Game apparatus, M. Virnoche. 411,402 Game apparatus for the manufacture of, V. L. Elbert. 411,022 Gas, apparatus for the manufacture of, V. L. Gas burners, heating attachment for, C. Long. 411,126 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,389 Gas regulator, W. C. Rossney. 411,062, 411,063 Gate. See Farm gate. Glassware, apparatus for reheating, H. Schulze- Berge. 411,132 Governor, S. Quast. 411,065 Grain binder, G. Greenlee, Jr. 411,025 Grain drill shoe, C. L. Fowle 411,144 Grain separator, J. Payer. 411,256
Peck
Peck
Peck
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,243 Galvanic battery, W. C. Thompson 411,400 Game apparatus, M. Virnoche. 411,402 Game apparatus, M. Virnoche. 411,222 Gas, apparatus for the manufacture of, V. L. Elbert. 411,222 Gas burners, heating attachment for, C. Long. 411,126 Gas engine, igniter for, I. F. Allman. 411,211 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,389 Gas regulator, W. C. Rossney. 411,062, 411,063 Gate. See Farm gate. Glassware, apparatus for reheating, H. Schulze-Berge. 411,132 Governor, S. Quast. 411,062 Grain binder, G. Greenlee, Jr. 411,056 Grain binder, G. Greenlee, Jr. 411,056 Grain mill safety device, L. Wagner. 411,404 Grain separator, J. Payer. 411,266 Grate, W. J. Owens. 411,391 Grate or fireplace front, J. M. Seymour. 411,267 Grate or fireplace front, J. M. Seymour. 411,267 Grating for illuminating tiles, T. Sharts. 411,134 Grinder, roll, P. F. Dooley. 411,056 Grindstone tool holder, A. H. Dick. 411,217 Gun, transportable or field, M. Dreger. 411,329
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,243 Galvanic battery, W. C. Thompson 411,400 Game apparatus, M. Virnoche. 411,420 Game board or apparatus, C. Gooch. 411,221 Gas, apparatus for the manufacture of, V. L. Elbert. 411,022 Gas burners, heating attachment for, C. Long. 411,124 Gas engine, igniter for, I. F. Allman. 411,211 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,389 Gar exulator, W. C. Rossney. 411,062, 411,063 Gate. See Farm gate. Glassware, apparatus for reheating, H. Schulze-Berge. 411,132 Grain mill safety device, L. Wagner. 411,052 Grain binder, G. Greenlee, Jr. 411,052 Grain mill safety device, L. Wagner. 411,404 Grain separator, J. Payer. 411,266 Grate, W. J. Owens. 411,379 Grate bar, E. J. Gordon. 411,379 Grate or fireplace front, J. M. Seymour. 411,379 Grate, W. J. Owens. 411,314 Grinder, roll, P. F. Dooley. 411,329 Gutta-percha, substitute for, C. A. A. H. Siebert. 411,171 Gutta-percha, substitute for, C. A. A. H. Siebert. 411,171
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,243 Galvanic battery, W. C. Thompson 411,400 Game apparatus, M. Virnoche. 411,402 Game apparatus, M. Virnoche. 411,402 Gas apparatus for the manufacture of, V. L. Elbert. 411,022 Gas, apparatus for the manufacture of, V. L. Gas burners, heating attachment for, C. Long. 411,126 Gas engine, igniter for, I. F. Allman. 411,211 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,359 Gas regulator, W. C. Rossney. 411,062, 411,063 Gate. See Farm gate. Glassware, apparatus for reheating, H. Schulze- Berge. 411,132 Glassware, furnace for heating, H. Schulze- Berge. 411,132 Grain binder, G. Greenlee, Jr. 411,056 Grain binder, G. Greenlee, Jr. 411,056 Grain binder, G. Greenlee, Jr. 411,056 Grain mill safety device, L. Wagner. 411,404 Grain separator, J. Payer. 411,256 Grate, W. J. Owens. 411,391 Grate bar, E. J. Gordon. 411,391 Grate or fireplace front, J. M. Seymour. 411,256 Grating for illuminating tiles, T. Sharts. 411,134 Grinder, roll, P. F. Dooley. 411,035 Grindstone tool holder, A. H. Dick. 411,171 Hair curling and crimping device, I. W. Hey- singer. 411,028
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware. 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,243 Galvanic battery, W. C. Thompson. 411,402 Game board or apparatus, C. Gooch. 411,221 Gas, apparatus, M. Virnoche. 411,221 Gas, apparatus for the manufacture of, V. L. Elbert. 411,022 Gas burners, heating attachment for, C. Long. 411,126 Gas engine, igniter for, I. F. Allman. 411,211 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,389 Gas regulator, W. C. Rossney. 411,062, 411,063 Gate. See Farm gate. Glassware, apparatus for reheating, H. Schulze- Berge. 411,132 Glassware, furnace for heating, H. Schulze-Berge 411,131 Governor, S. Quast. 411,052 Grain binder, G. Greenlee, Jr. 411,052 Grain binder, G. Greenlee, Jr. 411,053 Grain separator, J. Payer. 411,404 Grain separator, J. Payer. 411,404 Grain separator, J. Payer. 411,397 Grate or fireplace front, J. M. Seymour. 411,392 Grating for illuminating tiles, T. Sharts. 411,114 Grinder, roll, P. F. Dooley. 411,052 Graindstone tool holder, A. H. Dick. 411,217 Gun, transportable or field, M. Dreger. 411,217 Gun, transportable or field, M. Dreger. 411,217 Gun, transportable or field, M. Dreger. 411,317 Gutta-percha, substitute for, C. A. A. H. Siebert. 411,117 Hair curling and crimping device, I. W. Heysinger. 411,008 Grate bar, cell, p. F. Dooley. 411,008 Gutta-percha, substitute for, C. A. A. H. Siebert. 411,374 Harnesi loop, S. W. Shirk. 411,337
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,434 Galvanic battery, W. C. Thompson 411,400 Game apparatus, M. Virnoche. 411,402 Game apparatus, M. Virnoche. 411,402 Gas apparatus for the manufacture of, V. L. Elbert. 411,022 Gas, apparatus for the manufacture of, V. L. Gas burners, heating attachment for, C. Long. 411,126 Gas engine, igniter for, I. F. Allman. 411,211 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,369 Gas regulator, W. C. Rossney. 411,062, 411,063 Gate. See Farm gate. Glassware, apparatus for reheating, H. Schulze- Berge. 411,132 Glassware, furnace for heating, H. Schulze- Berge. 411,132 Grain drill shoe, C. L. Fowle 411,144 Grain separator, J. Payer. 411,062 Grain binder, G. Greenlee, Jr. 411,056 Grain binder, G. Greenlee, Jr. 411,056 Grain binder, G. Greenlee, Jr. 411,056 Grain mill safety device, L. Wagner. 411,404 Grain separator, J. Payer. 411,265 Grate, W. J. Owens. 411,391 Grate or fireplace front, J. M. Seymour. 411,276 Grate, W. J. Owens. 411,391 Grate or fireplace front, J. M. Seymour. 411,276 Grate, W. J. Owens. 411,391 Grate pring for illuminating tiles, T. Sharts. 411,314 Grinder, roll, P. F. Dooley. 411,093 Grate or fireplace front, J. M. Seymour. 411,292 Grating for illuminating tiles, T. Sharts. 411,134 Grinder, roll, P. F. Dooley. 411,093 Grate or fireplace front, J. M. Seymour. 411,292 Grating for illuminating tiles, T. Sharts. 411,134 Grinder, roll, P. F. Dooley. 411,093 Harmonica holder, A. B. Clark. 411,374 Harness loop, S. W. Shirk. 411,374 Harness loop, S. W. Shirk. 411,374 Harness loop, S. W. Shirk. 411,375
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware. 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,243 Galvanic battery, W. C. Thompson. 411,400 Game apparatus, M. Virnoche. 411,422 Gas burners, heating attachment for, C. Long. 411,223 Gas burners, heating attachment for, C. Long. 411,223 Gas burners, heating attachment for, C. Long. 411,235 Gas engine, igniter for, I. F. Allman. 411,211 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,363 Gate. See Farm gate. Glassware, apparatus for reheating, H. Schulze-Berge. 411,063 Gate. See Farm gate. Glassware, furnace for heating, H. Schulze-Berge. 411,063 Grain binder, G. Greenlee, Jr. 411,025 Grain mill safety device, L. Wagner. 411,496 Grain mell shee, C. L. Fowle. 411,416 Grain mill safety device, L. Wagner. 411,496 Grate, W. J. Owens. 411,397 Grate bar, E. J. Gordon. 411,379 Grate or fireplace front, J. M. Seymour. 411,379 Gra
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. 411,311 Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,424 Galvanic battery, W. C. Thompson 411,400 Game apparatus, M. Virnoche. 411,402 Gas, apparatus for the manufacture of, V. L. Elbert. 411,222 Gas, apparatus for the manufacture of, V. L. Elbert. 411,223 Gas burners, heating attachment for, C. Long. 411,236 Gas engine, igniter for, I. F. Allman. 411,211 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,389 Gas regulator, W. C. Rossney. 411,062, 411,063 Gate. See Farm gate. Glassware, furnace for heating, H. Schulze-Berge. 411,132 Governor, S. Quast. 411,062 Grain binder, G. Greenlee, Jr. 411,056 Grain binder, G. Greenlee, Jr. 411,056 Grain drill shoe, C. L. Fowle 411,141 Grain mill safety device, L. Wagner. 411,406 Graite bar, E. J. Gordon. 411,297 Grate bar, E. J. Gordon. 411,297 Grate or fireplace front, J. M. Seymour. 411,296 Grate, W. J. Owens. 411,391 Grate or fireplace front, J. M. Seymour. 411,297 Grate or fireplace front, J. M. Seymour. 411,297 Grate or fireplace front, J. M. Seymour. 411,297 Grate percha, substitute for, C. A. A. H. Siebert. 411,171 Hair curling and crimping device, I. W. Heysinger. 411,098 Harmonica holder, A. B. Clark. 411,374 Harness loop, S. W. Shirk. 411,374 Harness loop, S. W. Shirk. 411,374 Harnow, A. Callander. 411,009 Harrow, C. La Dow. 411,098 Harrow, disk, M. Daley. 411,388
Peck
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. 411,311 Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,243 Galvanic battery, W. C. Thompson 411,400 Game apparatus, M. Virnoche. 411,402 Game apparatus, M. Virnoche. 411,402 Gas apparatus for the manufacture of, V. L. Elbert. 411,222 Gas, apparatus for the manufacture of, V. L. Gas burners, heating attachment for, C. Long. 411,236 Gas engine, igniter for, I. F. Allman. 411,211 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,363 Gate. See Farm gate. Glassware, gupratus for reheating, H. Schulze-Berge. 411,132 Glassware, furnace for heating, H. Schulze-Berge 411,131 Governor, S. Quast. 411,062 Grain binder, G. Greenlee, Jr. 411,056 Grain binder, G. Greenlee, Jr. 411,056 Grain mill safety device, L. Wagner. 411,404 Grain separator, J. Payer. 411,266 Grate, W. J. Owens. 411,391 Grate or fireplace front, J. M. Seymour. 411,276 Grate part, E. J. Gordon. 411,379 Grate or fireplace front, J. M. Seymour. 411,379 Grater or fireplace front, J. M. Seymour. 411,379 Grate or fireplace front, J. M. Seymour. 411,379 Grate or fireplace front, J. M. Seymour. 411,379 Grate or fireplace front, J. M. Seymour. 411,379 Grater or fireplace front, J. M. Seymour. 411,379 Grater or fireplace front, J. M. Seymour. 411,379 Harmonica holder, A. B. Clark. 411,374 Harness loop, S. W. Shirk. 411,337 Harnow, A. Callander. 411,009 Harrow, C. La Dow. 411,383 Hat and coat holder, T. J. M
Peck. 411,332 Foot warmer, Blosfeld & Schnur. 411,132 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware. 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,243 Galvanic battery, W. C. Thompson. 411,400 Game apparatus, M. Virnoche. 411,402 Game board or apparatus, C. Gooch. 411,221 Gas, apparatus for the manufacture of, V. L. Elbert. 411,022 Gas burners, heating attachment for, C. Long. 411,132 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,389 Gas regulator, W. C. Rossney. 411,062, 411,063 Gate. See Farm gate. Glassware, apparatus for reheating, H. Schulze-Berge. 411,132 Governor, S. Quast. 411,062, 411,063 Grain binder, G. Greenlee, Jr. 411,025 Grain drill shoe, C. L. Fowle. 411,140 Grain separator, J. Payer. 411,404 Grain separator, J. Payer. 411,266 Grain frieplace front, J. M. Seymour. 411,266 Grain for illuminating tiles, T. Sharts. 411,134 Grinder, roll, P. F. Dooley. 411,295 Grate, W. J. Owens. 411,379 Grate or fireplace front, J. M. Seymour. 411,295 Grate, W. J. Owens. 411,379 Grate or fireplace front, J. M. Seymour. 411,296 Grating for illuminating tiles, T. Sharts. 411,314 Grinder, roll, P. F. Dooley. 411,095 Grater, v. J. Gwens. 411,317 Harrow, A. Callander. 411,009 Harrow, disk, M. Daley. 411,374 Harrow, A. Callander. 411,009 Harrow, disk, M. Daley. 411,374 Harrowster, corn, Stevens & Harvey. 411,388 Hat and coat holder, T. J. Manning. 411,348 Hat sweat and lining, detachable, F. W. Lewis. 411,348 Hat and coat holder, T. J. Manning. 411,348 Hat sweat and lining, detachable, F. W. Lewis. 411,348 Heater. See Air heater.
Peck. 411,332 Foot warmer, Blosfeld & Schnur. 411,132 Foot warmer, Blosfeld & Schnur. 411,182 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. 411,311 Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,385 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,434 Galivanic battery, W. C. Thompson 411,400 Game apparatus, M. Virnoche. 411,402 Game apparatus, M. Virnoche. 411,402 Gas apparatus for the manufacture of, V. L. Elbert. 411,022 Gas, apparatus for the manufacture of, V. L. Gas burners, heating attachment for, C. Long. 411,126 Gas engine, igniter for, I. F. Allman. 411,211 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,359 Gas regulator, W. C. Rossney. 411,062, 411,063 Gate. See Farm gate. Glassware, apparatus for reheating, H. Schulze-Berge. 411,132 Glassware, furnace for heating, H. Schulze-Berge. 411,132 Governor, S. Quast. 411,062 Grain binder, G. Greenlee, Jr. 411,056 Grain binder, G. Greenlee, Jr. 411,056 Grain binder, G. Greenlee, Jr. 411,056 Grain mill safety device, L. Wagner. 411,404 Grain separator, J. Payer. 411,256 Grate, W. J. Owens. 411,391 Grate bar, E. J. Gordon. 411,379 Grate or fireplace front, J. M. Seymour. 411,256 Grating for illuminating tiles, T. Sharts. 411,134 Grinder, roll, P. F. Dooley. 411,095 Grating for illuminating tiles, T. Sharts. 411,134 Grinder, roll, P. F. Dooley. 411,095 Harmonica holder, A. B. Clark. 411,171 Hair curling and crimping device, I. W. Heysinger. 411,098 Harmonica holder, A. B. Clark. 411,374 Harness loop, S. W. Shirk. 411,357 Harrow, A. Callander. 411,099 Harrow, C. La Dow. 411,199 Harrow, C. La Dow. 411,199 Harrow, C. La Dow. 411,199 Harrow, J. S. Gochnauer. 411,202 Head protector, H. G. Morrow. 411,388 Hat and coat holder, T. J. Manning. 411,341 Heater. See Air heater. 411,310
Peck
Peck
Peck
Peck. 411,332 Foot warmer, Blosfeld & Schnur. 411,312 Foot warmer, Blosfeld & Schnur. 411,152 Fork. Hay fork. Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware. 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,438 Galvanic battery, W. C. Thompson. 411,402 Game board or apparatus, C. Gooch. 411,221 Gas, apparatus, M. Virnoche. 411,022 Gas, apparatus for the manufacture of, V. L. Elbert. 411,022 Gas burners, heating attachment for, C. Long. 411,124 Gas process of and apparatus for manufacturing, Morse & Springer. 411,339 Gaste. See Farm gate. Glassware, apparatus for reheating, H. Schulze- Berge. 411,132 Governor, S. Quast. 411,062, 411,053 Grain binder, G. Greenlee, Jr. 411,052 Grain drill shoe, C. L. Fowle. 411,414 Grain mill safety device, L. Wagner. 411,414 Grain separator, J. Payer. 411,367 Grate or fireplace front, J. M. Seymour. 411,379 Grate or fireplace front, J. M. Seymour. 411,370 Grate or fireplace front, J. M. Seymour. 411,371 Gun, transportable or field, M. Dreger. 411,371 Gun, transportable or field, M. Dreger. 411,371 Hair curling and crimping device, I. W. Heysinger. 411,387 Harrow, A. Callander. 411,092 Harrow, C. La Dow. 411,193 Harrow, disk, M. Daley. 411,387 Harsester, corn, Stevens & Harvey. 411,488 Hat and coat holder, T. J. Manning. 411,374 Harness loop, S. W. Shirk. 411,375 Harrow, A. Callander. 411,093 Harvester, corn, Stevens & Harvey. 411,494 Heat protector, H. G. Morrow. 411,498 Hat and coat holder, T. J. Manning. 411,314 Helet trimming machine, F. N. Ethridge. 411,115
Peck
Peck. 411,338 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,625 Fork. Hay fork. 511,525 Fruit gatherer, C. J. Bloom
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,325 Fork. Hay fork. 5 Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware. 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,355 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,402 Galavanic battery, W. C. Thompson. 411,400 Game apparatus, M. Virnoche. 411,402 Game board or apparatus, C. Gooch. 411,212 Gas, apparatus for the manufacture of, V. L. Elbert. 411,022 Gas burners, heating attachment for, C. Long. 411,120 Gas engine, igniter for, I. F. Allman. 411,211 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,062, 411,063 Gate. See Farm gate. Glassware, apparatus for reheating, H. Schulze-Berge. 411,132 Glassware, apparatus for reheating, H. Schulze-Berge. 411,132 Glassware, furnace for heating, H. Schulze-Berge 411,131 Governor, S. Quast. 411,065 Grain binder, G. Greenlee, Jr. 411,025 Grain drill shoe, C. L. Fowle. 411,414 Grain mill safety device, L. Wagner. 411,404 Grain separator, J. Payer. 411,256 Grate, W. J. Owens. 411,379 Grate bar, E. J. Gordon. 411,279 Grate bar, E. J. Gordon. 411,270 Grate or fireplace front, J. M. Seymour. 411,286 Grind, transportable or field, M. Dreger. 411,379 Grate or fireplace front, J. M. Seymour. 411,407 Grain groil illuminating tiles, T. Sharts. 411,134 Grinder, roll, P. F. Dooley. 411,379 Grate or fireplace front, J. M. Seymour. 411,407 Grain drill shoe, C. K. Fowle. 411,417 Hair curling and crimping device, I. W. Heysinger. 411,374 Harness loop, S. W. Shirk. 411,337 Harrow, A. Callander. 411,009 Harmonica holder, A. B. Clark. 411,137 Harrow, A. Callander. 411,009 Harrow, disk, M. Daley. 411,376 Harvester, corn, Stevens & Harvey. 411,384 Heater. See Air heater. 411,408 Heater. See Air heater. 411,408 Hoist, self-locking differential, C. F. Batt. 411,656 Hoist, self-locking differ
Peck.
Peck. 411,332 Flue scraper, boiler, W. T. Coggeshall. 411,324 Foot warmer, Blosfeld & Schnur. 411,325 Fork. Hay fork. 5 Fruit gatherer, C. J. Bloom. 411,007 Fuel controller, thermostatic, E. R. Ware. 411,311 Furnace. See Boiler or other furnace. Metallurgical furnace. Furnaces, condensing fumes from metallurgic, F. P. Dewey. 411,014 Furnaces, hydrocarbon burner for, A. Lentz. 411,355 Furnaces, relighting the flame in hydrocarbon, C. L. Goodridge. 411,402 Galavanic battery, W. C. Thompson. 411,400 Game apparatus, M. Virnoche. 411,402 Game board or apparatus, C. Gooch. 411,212 Gas, apparatus for the manufacture of, V. L. Elbert. 411,022 Gas burners, heating attachment for, C. Long. 411,120 Gas engine, igniter for, I. F. Allman. 411,211 Gas, process of and apparatus for manufacturing, Morse & Springer. 411,062, 411,063 Gate. See Farm gate. Glassware, apparatus for reheating, H. Schulze-Berge. 411,132 Glassware, apparatus for reheating, H. Schulze-Berge. 411,132 Glassware, furnace for heating, H. Schulze-Berge 411,131 Governor, S. Quast. 411,065 Grain binder, G. Greenlee, Jr. 411,025 Grain drill shoe, C. L. Fowle. 411,414 Grain mill safety device, L. Wagner. 411,404 Grain separator, J. Payer. 411,256 Grate, W. J. Owens. 411,379 Grate bar, E. J. Gordon. 411,279 Grate bar, E. J. Gordon. 411,270 Grate or fireplace front, J. M. Seymour. 411,286 Grind, transportable or field, M. Dreger. 411,379 Grate or fireplace front, J. M. Seymour. 411,407 Grain groil illuminating tiles, T. Sharts. 411,134 Grinder, roll, P. F. Dooley. 411,379 Grate or fireplace front, J. M. Seymour. 411,407 Grain drill shoe, C. K. Fowle. 411,417 Hair curling and crimping device, I. W. Heysinger. 411,374 Harness loop, S. W. Shirk. 411,337 Harrow, A. Callander. 411,009 Harmonica holder, A. B. Clark. 411,137 Harrow, A. Callander. 411,009 Harrow, disk, M. Daley. 411,376 Harvester, corn, Stevens & Harvey. 411,384 Heater. See Air heater. 411,408 Heater. See Air heater. 411,408 Hoist, self-locking differential, C. F. Batt. 411,656 Hoist, self-locking differ

220	Scientific g	American.
inkstand, pocket, E. Ehnlich	Saw, circular, S. P. Grey	Paper, commercial note v
Jars, forming the necks of fruit, C. F. & C. Leng. 411,043 Joint. See Rail joint. Key. See Telegraph key.	Sawdust elevator, W. Frey	Paper, parchmentized, Lea Company Pens, metallic, Poure, O'Ko
Key fastener, E. C. Townsend 411,076 Knitting machine, Sanborn & Merrow 411,303 Knitting machine, straight, G. Templeman 411,113	Saw tooth swage, C. O. & A. D. Porter. 411,055 Scaffold, T. E. Williams. 411,363 Scale, weighing, T. H. Herndon. 411,336	Pills of essence of tar, A. F. Remedy for internal and esternal venner
Lamp, C. D. Aria	Scraper, wheeled, A. Brown 411,119 Screw, G. P. Rose 411,202	Shoe elastic, boots, and a Company
Jamp, arc, F. R. Boardman 411,088 Lamp, electric arc, F. E. Kinsman 411,287 Lamp shade holder, C. G. Perkins 411,107	Screw threads on articles of sheet metal, machine for forming, W. F. Lewis. 411,156 Seaming machine, metal, J. Solter 411,071	17,019 to 17 Underwear, J. Meyer & Co.
Lamps, manufacture of incandescent electric, T. A. Edison	Seaming tin boxes, machine for, H. P. F. Ewers. 411,331 Seat. See Vehicle seat. Seed, machine for delinting cotton, J. H.	A Printed copy of the
W. Cooke. 411,375 Lantern, O. Handeland 411,222 Lantern attachment, J. W. Feeny 411,218	McCormick	any patent in the foregoing this office for 25 cents. In o and number of the patent
Lantern, magic, J. B. Colt. 411,092 Life-line, floating, E. Maynard 411,161 Lighting device, hydrocarbon, Schulz & Cody 411,170	Sewing machine shuttles, raceway for rotary, D. E. Marsh	Co., 361 Broadway, New Yor Canadian Patents in inventors for any of the in
Limb, artificial, F. H. Fairchild	Sheet metal shaping machine, H. Aiken	going list, provided they each. If complicated, the
Lock. See Elevator lock. Hasp lock. Nut lock. Loom for weaving tufted fabrics, A. Siret	Shock or bundle tyer, W. W. Huffman 411,033 Shot canister, E. Harigel 411,123	full instructions address New York. Other foreign
Loom Jacquard mechanism, H. Wyman 411,409 Loom shuttle, S. A. Dudley 411,187 Loom shuttle, Elsas & Weissenburger 411,097	Shovel, J. Pfeifer	Movert
Loom shuttle box locking device, G. F. Hutchins. 411,197 Loom shuttle box, mechanism, H. Wyman 411,408 Loom let-off and take-up mechanism, W. C.	Sink and kitchen cabinet combined, J. H. Rice	Inside Page, each inse Back Page, each inse The above are charges
Taucke	Spark arrester, J. Q. Donnald	words per line. This notice and is set in agate type. tisements at the same rate ment, as the letter preserved at publication off
Kelly 411,333 Marking pad, indelible, J. R. Smith 411,264 Mattress bed bottom, wire, J. B. Ryan 411,302	Speculum, J. A. Maloney 411,160 Spinning mule, E. Wright 411,082 Spring. See Vehicle spring. 411,082	received at publication off ing to appear in next issue
Meat tenderer, rotary, J. G. Schmidt	Spring motor, P. J. & E. H. Gates. 411,099 Staging, G. W. Zeigler 411,273	USE A DAMANT
Malone	Stamp, hand, M. L. Luebben	TO MAN ON THE REAL PROPERTY OF THE PARTY OF
& Lash 411,205 Metallic circuit, H. F. Campbell 411,137 Metallurgical furnace, C. Peifer 411,226	Steam boiler, P. Hanrez. 411,191 Steam washer, W. Klahr. 411,224 Stopper. See Bottle stopper.	
Mining machine and apparatus for operating the same, F. M. Lechner	Stove doors, pin for hinges of, D. C. Kuhn 411,152 Stove grate, W. J. Andrews 411,317 Stove grate, J. F. Brayer 411,184	The State of
Mosquito net frame and sham pillow holder, W. 411,073 Tennison	Stove, lamp, W. H. Wilder 411,209 Stove, oil, A. C. West 411,406 Stove pipe coupling, A. J. Robinson 411,130	
Motor. See Electro-motor. Spring motor. Mowing machine, C. M. Brown	Structures, construction of metallic, F. H. Cilley. 411,013 Switch. See Railway switch. Tackle block, J. Dunn	ICE-HOUSE AND G. Hatfield. With direct engravings. Contained in PLEMENT, 59. Price 10 of and of all newsdealers.
Mowing machine knife grinder, O. H. Jones	Teeth, fastening artificial, G. M. Weirich 411,272 Telegraph key, A. E. Johnson 411,198	and of all newsdealers.
Music holder, O. S. Donnell 411,280 Music stand, A. W. Sibley 411,111 Nail blank plate, M. Chase 411,278	Telephone, mechanical, C. M. Radford 411,058 Thill coupling, F. J. Miller 411,044 Tidy holder, Gira & Gfell 411,188	0.75
Needle, E. Swem	Tile. roofing, J. Rapp	6°/5
Cook 411,325 Nut lock, H. Kleman 411,125 Nut lock, A. Spear 411,265	Track jack, ratchet, T. R. Gabel	1
Nut lock, D. Steiner 411,306 Oils, apparatus for burning hydrocarbon, J. S. 411,103	Trousers, waistband for, J. E. Leavitt. 411,250 Truck, car, W. H. H. Sisum 411,068 Truck, hand, B. Riddell 411,353	Seneca Falls Mfg. Co., 695
Ointment, H. G. Turley 411,077 Organs, reed and flue pipe for, J. Stafford 411,135 Oven, baker's, G. E. Bailey 411,180	Truck, house moving, G. Gary	THE WHEREWI' Townsend's 19th and 20 education at a glance. V Logical, Industrial, and No
Oyster opener, J. P. Huppmann 411,381 Packing, journal, H. B. Devlan 411,326 Packing, steam pipe, C. T. Lee 411,384	Tubes, mechanism for the manufacture of, J. Robertson	form, One Dollar. Fr Back lid—Seven words an inside pages for the seven
Pad. See Eyeglass nose pad. Marking pad. Paddle hydro-motor, E. Pombas	Typewriting machine, W. F. Judy	
Padlock, J. E. Opal 411,054 Pan. See Defecating pan. 2 Paper bag, making, W. A. Lorenz 411,288	Typewriting machine, F. X. Wagner.	and VI
Paper box, P. O. Soper 411,398 Paper calendering machine, J. McLaughlin 411,051 Paper folding machine, J. C. Kneeland 411,151	Valve, steam-actuated, W. L. G. Williams	PLANED RI Send stam
Paper hanger's folding table, H. W. Allen	Vehicle spring, E. Jarrell	
Paper, manufacturing bundles of toilet, O. H. Hicks		
Pencil sharpener and paper weight, combined, A. Thurber	Washing machine, H. Nadorff. 411,349 Washing machine, I. B. Warren 411,233 Watch, repeating, E. Heuer 411,148	Coal
and washing, W. K. Moody 411,253 Plano action, Kranich & Bach 411,248 Pile fabric, W. H. Bairstow 411,085	Watch, stem winding and setting, O. F. Gunz, 411,146, 411,147	Elec
Pillow sham adjuster, J. B. Pugh	Water purifying apparatus, F. H. Moore 411,292 Water wheel, H. J. Adams 411,210	In
Pipe or boiler covering, steam, P. Carey. 411,091 Pipe wrench, O. C. Stanley. 411,266 Plant protector, Moore & Love. 411,347	F. Wiley	motor devised and constraint amateurs to make a mot advantage by a current
Planter, L. Schofield	Wheelbarrow, B. H. Barr	lathe or any machine req With 11 figures. Contain SUPPLEMENT, No. 641.
Muir 411,216 Planter, corn, G. H. Evans, Jr 411,286 Plow, J. W. Leas 411,346	Window screen, L. W. Braun	BUCK UBIII
Pole changer, automatic, C. A. Danals	Wire hook or hanger, I. J. Turner 411,307	AIR COMP
Precious metals from their ores, extracting, J. S. MacArthur		MINING, TUNNE
Printing press hand protector, C. Reussenzehn 411,25 Protector. See Head protector. Plant protector. Printing machine hand protector.		QUARRY & RAILR
Pulley moulding machine, J. C. McDermott	DESIGNS.	
Pump, double-acting force, J. Schrankel 411,26 Pumping engine, F. M. Wheeler 411,17 Radiator, portable steam, J. C. Mackey 411,15	7 Feather, artificial, H. H. Plaut 19,31	
Radiator sections, coupling for, J. J. Hogan	Hose carriage body, Gleason & Ryan	
Rail joint, lock, P. C. Dockstader	TRADE MARKS.	thos
Railway rail, H. W. Libbey. 411,34 Railway switch, A. Boucher. 411,08 Railways, overhead frog for electric M. J. Wight- 411,212,411,212	9 B. H. Smith	
man	Champagne, Krug & Co. 17,03 Chocolate, Menier 17,03	
McGregor		4
Regulator and cut-off, King & Swaney. 411,04 Resawing machine, E. Fischer. 411,03 Rivet, J. J. Unbehend. 411,17	Lace, cotton, Les Fils de Cartier-Bresson17,026, 17,028 Liquor extracted from cherries, Dubonnet Freres. 17,03	9 Bes
Rock drilling machine, H. B. Utter 411,07 Rotary shears, Thomas & Haviland 411,07 Saddle, riding, J. S. Sullivan 411,07	Mineral spring water, natural, D. W. Brown 17,01 Paints, compositions, anti corrosives, and anti-	
Sash fastener, H. H. Meyer		5

30	Paper, commercial note writing, H. S. Crocker &	
89	Co	
32	Paper, parchmentized, Leatheroid Manufacturing	
41	Company	
95	Pens, metallic, Poure, O'Kelly & Co 17,041	
)55	Pills of essence of tar, A. Bertelli & Co 17,016	
663	Remedy for internal and external use, liquid, J. F.	
3 6	Venner 17,046	
19	Shoe elastic, boots, and shoes, Herbert & Rapp	
02	Company 17,036	1
	Thread, cotton, Les Fils de Cartier-Bresson,	1
156	17,019 to 17,025, 17,027, 17,028, 17,030, 17,031	ľ
)71	Underwear, J. Meyer & Co 17.040	l
331	Wine, champagne, J. Bollinger	Ì

A Printed copy of the specification and drawing of any patent in the foregoing list will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the fore going list, provided they are simple, at a cost of each. If complicated, the cost will be a little more. For full instructions address Munn & Co., 361 Broadway New York. Other foreign patents may also be obtained

Advertisements.

Inside Page, each insertion - - - 75 cents a line. Back Page, each insertion - - - \$1.00 a line. The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to among in part issue.

USE ADAMANT WALL PLASTER



It is Hard, Dense, and
Adhesive. Does not check
or crack. It is impervious
to wind, water, and disease
germs. It dries in a few
hours. It can be applied in
any kind of weather. It is
in general use. Licenses
granted for the mixing,
using, and selling. Address

🔄 ADAMANT MFG. CO. 71 E. Genesee Street, Syracuse, N. Y.

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SWP-PLEMENT, 59. Price 10 cents. To be had at this office and of all newsdealers.



Seneca Falls Mfg. Co., 695 Water St., Seneca Falls, N. Y. THE WHEREWITHAL HAS COME!

ownsend's 19th and 20th Century Wherewithal. All lucation at a glance. Without Text Books. Scientific, ogical, Industrial, and Natural as Life itself. Portfolorm. One Bollar. Front lid—Title and directions, ack lid—Seven words and thirty-one definitions. Two side pages for the seven words and their practice. The Wherewithal Company, Philadelphia.

CABINET WOODS and VENEERS, FRET SAW or BRACKET WOODS, PLANED READY FOR USE Send stamp for catalogue.

HENRY T. BARTLETT, 200 LEWIS STREET,



INGERSOLL-SERGEANT

INGERSOLL-SERGEANT
ROCK DRILL CO.
10 Park Place, N. Y.
Rock Drills,
Air Compressors,
Stone Channeling Machines
Coal Cutters,
Diamond Core Drills,
Boilers, Hoists,
Electric Blasting Batteries,
Complete Plants of Mining, Tunneling, and Quarrying Machinery.

ELECTRO MOTOR. SIMPLE, HOW TO make. By G. M. Hopkins.—Description of a small electro motor devised and constructed with a view to assisting amateurs to make a motor which might be driven with advantage by a current derived from a battery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power. With 11 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641. Price 10 cents. To be had at this office and from all newsdealers.





Square, Oval, or Round Smooth Holes. For Carpenter, Cabinet, and Pattern work, ½ inch, 50 cents, set \$4.00, mailed free. Bridgeport Gun Implement Co., 17 Maiden Lane, New York.

THE GREAT DESERTS OF THE Earth—An interesting paper by Joseph F. James descriptive of the desert regions of the globe and their geological features and extent. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 703. Price 10 cents. To be had at this office and from all newsdealers



Branch Office and Factory, 203, 205 & 207 Center St., N. Y.

ICE-HOUSE AND REFRIGERATOR. Directions and Dimensions for construction, with one illustration of cold house for preserving fruit from season to season. The air is kept fry and pure throughout the year at a temperature of from 34° to 36°. Contained in SCIENTIFIC AMERICAN SWPPLEMENT NO. 116. Price 10 cents. To be had at this office and of all newsdealers.



THE LABORER AND HIS EMPLOYER. All ELING THE LAND TH



SOME OF THE THINGS NOW AC SOME OF THE THINGS NOW ACcomplished by the Manufacturers of Iron and Steel.—Abstract of a paper by Sir James Kitson, treating of the subjects of blast furnaces, blowing engines, shearing machines, testing machines, forging presses, etc., and of the great things that are now being accomplished with them in their present improved state. Contained in SCINNTIFIC AMERICAN SUPPLEMENT, No. 703, Price 10 cents. To be had at this office and from all newsdealers.



PHONOPORE - DESCRIPTION of Langdon-Davies' new system of multiple telegraphy by means of an apparatus called the Phonopore, which can be made to work side by side with ordinary telegraphs without interfering with them. With 7 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 698. Price 10 cents. To be had at this office and from all newsdealers.

Fine Taps, Dies, Reamers, Etc.



Lightning and Green River Screw Plates. Bolt Cutters, Hand and Power Drilling Machines, Punching Presses, Tire Benders, Tire Upsetters, and other Labor Saving Tools. Send for Price List. WILEY & RUSSELL MFG. CO., Greenfield, Mass.

Manufacturers, Agriculturists, Chemists, Engineers, Me. men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has recently been published for free circulation at the office of this paper. Subjects classified with names of author. Persons desiring a copy, have only to ask for it, and it will be mailed to them. Address, MUNN & CO., 361 Broadway, New York

OTHER Life Policies as liberal cost as little money, no others as cheap give as much for the money, as those of

THE TRAVELERS

OF HARTFORD, CONN.

Best either for Family Protection or Investment of Savings. Non-forfeitable, world-wide, lowest cash rate.

VAN CLEVE'S

nglish and American Vechanic

NOW READY.

THE ENGLISH AND AMERICAN MECHANIC. Comprising a co lection of over 3.000 Receipts, Rules, and Tables designed for the use of every Mechanic and Manufacturer. By B. Frank Van Cleve. Illustrated, 283 pages. 12mo. Price \$1.50, by mail, free of postage to any address in the World.

Among the contents of this valuable and useful book are Explanation of diagrams for sheet metal work; Contents in gallons of different vessels: Weights of Pipes; Tinblates; Oil Canisters, with the quantity of tin required; Diamieters. Circumferences. and Areas of Circles and the content of each in gallons at one foot in depth; Arithmetic; Practical Geometry; Mensuration; Slide Rule; Steam and the Steam Engline; Belts; Limes, Cements, Mortars, and Concretes; Artificers' Rules and Tables for computing the work of Bricklayers, Well Diggers, Masons, Carpenters, Joiners, Slaters, Plastersers, Painters, Glaziers, Paivers, and Plumbers; Sewers, Arches, and Abutments; Flour Mills, Saw Mills, Woodwrking Machinery; Water Power; Solders; Fusible Compounds; Fluxes for Soldering or Welding; Strength of Materials; Weisths of Materials; Wheel Gearing; Gauging; Alloys and Compositions; Rare and Valuable Receipts for Mechanical Purposes.

FA a circular, 4 pages 4to, showing the full table of con-tents of this important book, will be sent free of postage to anyone in any part of the world who will furnish his address. To Our New Revised Descriptive Catalogue of Practi-cal and Scientific Books, St. pages, Sro, and our Catalogues of Books on Steam and the Steam Engine, Mechanics, Machinery, and Dynamical Engineering, and other Catalogues, the whole covering every branch of Science applied to the Arts, sent free and free of postage, to any one in any part of the world who will furnish his address.

HENRY CAREY BAIRD & CO. 810 Walnut St., Philadelphia, Pa., U. S. A.

<u>ARCHITECTURAL</u>

Useful, Beautiful, and Cheap.

To any person about to erect a dwelling house or sta ble, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the Archi-TECTS' AND BUILDERS' EDITION of the SCIENTIFIC AMERICAN.

The information these volumes contain renders the work almost indispensable to the architect and builder and to persons about to build for themselves they will find the work suggestive and most useful. They contain colored plates of the elevation, plan, and detail drawings of almost every class of building, with specifica-

Seven bound volumes are now ready and may be obtained, by mail, direct from the publishers or from any newsdealer. Price, \$2.00 a volume. Stitched in paper covers. Subscription price, per annum, \$2.50. Address

MUNN & CO., Publishers, 361 Broadway, New York.

DRIERS for Grain, Sand, Salt, Wet | S. E. Worrell Feed, Chemicals, etc. | Hannibal, Mo.



DRY PLATE EMULSIONS.—A PAPER by E. H. Lyon, presenting a formula for easily making plates that will give excellent negatives with an exposure of two seconds, stop J-15, upon an open landscape in June. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 696. Price 10 cents. To be had at this office and from all newsdealers.

OIL WELL SUPPLY CO. Ltd.

91 & 92 WATER STREET, Pittsburgh, Pa.,
Manufacturers of everything needed for
ARTESIAN WELLS for either Gas, Oil, Water, or Mineral
Tests, Boilers, Engines, Pipe,
Cordage, Drilling Tools, etc.
Illustrated catalogue, price
lists and discount sheets
on request.

THE PROPELLING MACHINERY OF War Vessels.—A paper by H. J. Oram, Engineer R. N., of the Controller of the Navy's Department, etc. A description of the most important of the recent changes that have taken place in marine engineering, and a discussion of other matters of interest. in connection, principally, with the propelling machinery of modern war ships. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 692. Price 10 cents. To be had at this office and from all newsdealers.



ARTESIAN

and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 600 ft Send 6cents for illustrated Catalogue. Pierce Artesian and Oil Well Supply Co., 80 Beaver Street, New York.

NEWSPAPER DERFECT APER FILE

The Koch Patent File, for preserving newspapers, Mag-azines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERI-CAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of \$1.50 by mail. or \$1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN" in gilt. Necessary for every one who wishes to preserve the paper. Address MUNN & CO., Publishers Scientific American.



HARRISON CONVEYOR!

Handling Grain, Coal, Sand, Clay, Tan Bark, Cinders, Ores, Seeds, &c. Send for BORDEN, SELLECK & CO., {Sole (Manu'fers,)} Chicago, IIL

PULLEYS, HANGERS, PROGRESS MACHINE WORKS, A. & F. BROWN, FRICTION CLUTCHES. 44 Park Place, N. Y.



BARNES PAT. FOOT POWER MACHINERY.

I feel so highly pleased with your Velocipede Foot Power with seat, that I wish to add my testimony to this superiority. I did not expect to like it, but having used the velocipede Power, I would have nothing else. It so greatly lessens the fatigue of be almost without tatigue, and is a steadier motion. I only wish I had known of it sooner. Send for catalogue. W. F. & J. BARNES CO., 999 Ruby St., Rockford, Ill.



ORTABLE TURNISH TAKENSON B MUNSON' AND M MANUFACTUR

The MOTOR of 19th CENTURY. Can be used Any Place, to do Any Work, and by Any One. No Boiler!
No Fire! No Steam! No Ashes!
No Gauges! No Engineer! A perfectly safe Motor for all places and purposes. Cost of operation about one cent an hour to each indicated horse power. For circulars, etc., address

Charter Gas Engine Co. Simplicity, Safety. P.O. Box 148, Sterling, Ill.

INVENTORS and others desiring new articles manufac-tured and introduced, address P. O. Box 86, Cleveland, O.



The Stevens Portable Mills For CORN and FEED Grinding.

Genuine French BUHR STONES POWER CORN SHELLER.

Prices below the lowest.

A. W. STEVENS & SON,

AUBURN, N. Y. Also Mfrs. of Threshers and Engines.



GEO. P. CLARK, Box L, Windsor Locks, Conn.

THE VICTOR TYPEWRITER

Has Eighty Characters. Excels in Speed, Durability and Quality of Work. Perfect Alignment.

Price, only \$15.00.

See illustrated notice in Scientific American, September 28, 1889, page 197.

THE TILTON MFG. CO., 115 Purchase St., Boston, Mass.



Counts accurately the movements or production of machinery. Saves labor and time. Send for circula GEO. E. 1VES, 379 State Street, New Haven, Conn.

ON FLAME.—A PAPER BY F. J. ROWan on the general principles of the subject. Nature of a flame, temperature and propagation of flame, luminosity of flames. Contained in Scientific AMERICAN SUPPLIEMENT, NO. 701. Price 10 cents. To be had at this office and from all newsdealers.

MAGIC
LANTERNS
and STEREO PTICONS for
Public Exhibitions and for
Home Amusement, Views
illustrating every subject, a
very profitable business for a
man with small capital. Best apparatus, new views, largest
stock. 26 years practical experience, 170-p., catalogue free,
GEO. H. PIERCE, 140 S. 11th St., Philadelphia, Pa.

SBESTOS Fire Felt Coverings, Scheathings, &c. The CHALMERS-SPENCE CO., Mfrs. 419-425 Sth Street, East River, N. Y.

BOOKWALTER CASTING CO.

Address THE BOOKWALTER CASTING CO., Springfield, Ohio.

CUTLER

THE PULSOMETER.—BY PROF. DE Volson Wood. A discussion of the theory of the apparatus and a mathametical analysis of its work. With 1 figure. Contained in SCHENTIFIC AMERICAN SUPPLEMENT, No. 704. Price 10 cents. To be had at this office and from all newsdealers.

PHE PENNA. DIAMOND DRILL & MFG. CO. BIRDSBORO, PA., Builders of High Class Steam Engines, Diamond Drilling and General Machinery, Flour Mill Rolls Ground and Grooved.



THE ORIGIN AND MANUFACTURE of Playing Cards.—An interesting paper by George Clulow, treating of the history of playing cards and the various methods of manufacturing them at different epochs. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 704. Price 10 cents. To be had at this office and from all newsdealers.

🛎 Perforated Electric Belting

SWIFT RUNNING MACHINERY.

Write for Descriptive Catalogue to

CHAS. A. SCHIEREN & CO. 45-51 FERRY ST., NEW YORK.

75.00 to 250.00 A MONTH can be made working for us. Agents preferred who can furnish a horse and give their whole time to the business. Spare moments may be profitably employed also. A few vacancies in towns and cities B. F. JOHNSON & CO., 1009 Main St., Richmond, Va., N.B.-Please state age and husiness experience. Never mind about sending stamp for reply. B. F. J. & CO.

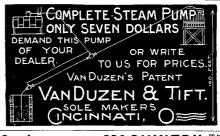


FREE elry by sample only; can live at home. We furnish Team Free. Full particulars and sample case Free. We mean just what we say, and do exactly as we agree. Address at once, Standard Silverware Co., Boston, Mass.

THE EIFFEL TOWER.—AN EXCELlent engraving of the Eiffel one thousand-feet-high tower, which was opened to the public a few days ago, and which is to form a part of the French Exposition attractions, may be found, with description, in the Scinking American Supplement, No. 554. To be had from newsdealers or at this office. Price 10 cents.

The Paris Exposition--Illustrated.

The SCIENTIFIC AMERICAN SUPPLEMENT will for some months to come contain illustrations of the buildings and the most interesting objects to be seen at the great French Exposition opened at Paris a fewdays ago. The illustrations which will embellish the SCIENTIFIC AMERICAN SUPPLEMENT will add an interesting and useful feature to the publication, and subscribers to the regular edition of the SCIENTIFIC AMERICAN SUPPLEMENT are advised to have their name enrolled on the SUPPLEMENT are advised to have their name enrolled on the SUPPLEMENT subscription list at once, so as to secure all the illustrated exposition numbers for preservation. Price, \$5 a year, \$2.30 for six months. News agents everywhere receive subscriptions, or remit to the publishers, MUNN & CO., 361 Brondway, New York.



2nd MACHINERY 🖺

RAILWAY AND STEAM FITTERS' SUPPLIES Rue's Little Giant Injector.

SCREW JACKS, STURTEVANT BLOWERS, &c. JOHN S. URQUHART, 46 Cortlandt St., N. Y.

Send to American Watch Tool Co., Waltham, Mass., for circular of No. 3 Bench Lathe. A Screw Cutting Lathe 32 in. by 7 in. swing.

ELECTRIC STREET RAILWAYS.—AN interesting review, by Eugene Griffin, of the present aspect of the question of street railway cars operated by electricity. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 70°2. Price 10 cents. To be had at this office and from all newsdealers.



PLAYS Dialogues, Tableaux, Speakers, for School, Club & Parlor. Best out. Catalogue free. T. S. Denison, Chicago, Ill.

Proposals for Improved Designs of Postal Cards.—POST OFFICE DEPARTMENT, OFFICE OF POSTMASTER GENERAL, WASHINGTON, D. C., Sept. 18, 1889.—In order to secure, if possible, an improved design and border for postal cards, sealed proposals are invited from artists, designers, and others, and will be received at this Department until 12 o'clock noon. on Wednesday, November 6, 1889, for such designs or drawings for the purpose, as bidders may wish to submit. Proposal should be made on the blank forms provided by the Department, securely enveloped and sealed, endorsed "Proposals for new designs for postal cards," and addressed to the Third Assistant Postmaster General, Washington, D. C. Blank forms of proposal, with specifications and information, will be furnished on application to the Third Assistant Postmaster General,

Proposals for Construction of Protection Wall at Navy Yard, Lengue Island, Pn.—September 10, 1889.—Seale d proposals, endorsed "Proposals for Protection Wall, to be opened October 8, 1889." will be received at the Bureau of Yards and Docks, Navy Department, Wash ington, D. C., until 11 o'clock A.M., October 8, 1889, and publicly opened immediately thereafter, for the construction of 400 feet, more or less, of protection wall at the Navy Yard, League Island, Pa. Plans can be seen and blank forms of offer, with specifications and all necessary information obtained upon application to the Commandant of the League Island Navy Yard. The Department reserves the right to reject any proposal not deemed advantageous to the Government, and to waive defects. Responsible security will be required for the faithful performance of the contract, and the bidder's bond will be twenty per cent. of the amount of their proposal for the work.

G. B. WHITE, Chief of Bureau,



THE GOVERNING PROPORTIONS OF Steam Boilers.—A lecture by C. E. Emery, Ph.D., delivered in the Sibley College Course. A presentation and discussion of curves derived from experiments showing the quantity of water evaporated in a well designed boiler, and a comparison of the results with those obtained in practice with boilers of different kinds and sizes. With 31 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 687 and 688. Price 10 cents each. To be had at this office and from all newsdealers.



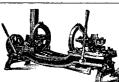
"Lucigen" BRILLIANT! POWERFUL! DIFFUSIVE!

Burns Petroleum Oil sprayed by compressed air. SIMPLE! SAFE! AND ECONOMICAL!
Thousands in use in Iron Works, Machine Shops, and Railroad Yards.
Lamps & Burners from 200 to 10,000 candle power.
MANUFACTURED BY THE
INDUSTRIAL LIGHT COMPANY,

196 Temple Court, New York City.

MADE WITH BOILING WATER.

MADE WITH BOILING MILK.



BARREL, KEG, Hogshead,

STAVE MACHINERY. Over 50 varieties manu-factured by E. & B. HOLMES,

dering, Howeling, and Crozing. BUFFALO, N. Y.

MECHANICAL QUARRYING AND Stone Cutting.—Description of Mr. Paulin Gay's apparatus for the mechanical working of stone consisting of the helicoidal saw for the cutting of rock masses into blocks, a modification of the same for dividing the blocks into thin slabs, and a machine for polishing the slabs. With 24 illustrations. Contained in Scientific American Supplement, No. 704. Price 10 cents. To be had at this office and from all newsdealers.



A PRACTICAL SUCCESS.
VANDUZEN'S PAT. LOOSE PULLEY OILER.
Thousands in satisfactory everyday use. Entire reliability and constancy demonstrated in a two years' test by (would be) Fastern skeptics.
Economy shown by reasonable prices and perfect performance. Send for our "Catalogue No. 55."
VAN DUZEN & TIFT. Cincinnati, O

FOR SALE in whole or part, Patent 391,899. Address, D. KILPATRICK, Morning Sun, Iowa.

WANTED correspondence with a responsible party or firm of Engineers or Machinists, with a view of manufacturing and placing on the market a most valuable patented article for use on all kinds of steam engines, pumps, etc. Address, I. W. D., P. O. Box 773, New York.

WANTED A TEACHER OF DRAWING in the Evening

JERSEY CITY BUSINESS COLLEGE, 23 and 25 Newark Avenue. Jersey City. References required. Address, W. E. DRAKE, Principal.

The Scientific American **PUBLICATIONS FOR 1889.**

The prices of the different publications in the United States, Canada, and Mexico are as follows.

RATES BY MAIL.

The Scientific American (weekly), one year \$3.00

The Scientific American Supplement (weekly), one year. 5.00

one year, . . 5.00

The Scientific American, Architects and Builders
Edition (monthly), one year 2.50

COMBINED RATES. The Scientific American and Supplement,

The Scientific American and Architects and Builders Edition. 5.00 The Scientific American, Supplement, and Architects and Builders Edition.

Proportionate Rates for Six Months. This includes postage, which we pay. Remit by postal express money order, or draft to order of MUNN & CO., 361 Broadway, New York.

WORKING MODEL'S & LIGHT MACHINERY. INVENTIONS DEVELOPED. Send for Model Circular. Jones Bros. E. Ca., Cin'ti. O.

Adrertisements.

Inside Page, each insertion - - - 75 cents a line. Back Page, each insertion · - - \$1.00 a line.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.



All Books, App. SCHOOL OF ELECTRICITY, N. Y



GRAPHOPHONE AND PHONOGRAPH. An interesting account of the Edison, Bell, and Taintor apparatus for the mechanical reproduction of speech, with detailed description of the same. With II figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 669. Price 10 cents. To be had at this office and from all newsdealers.



cientific Book Catalogue

RECENTLY PUBLISHED.

Our new catalogue containing over 100 pages, including works on more than fifty different subjects. Will be mailed tree to any address on application. MUNN & CO., Publishers Scientific American

361 Broadway, New York.

HIGH-GRADE ONLY. COLUMBIA

Bicycles, Tricycles, Tandems, Safeties. Catalogue free. POPE MFG. CO., Boston, New York, Chicago.

THE PHONOGRAPH.—A DETAILED description of the new and improved form of the phonograph just brought out by Edison. With 8 engravings. Contained in SCHNTIFIC AMERICAN SUPPLIMENT, No. 632. Price 10 cents. To be had at this office and from all newsdealers.



OIL ENGINES.

For Printers, Steam Yachts, pumping water, sawing wood, making ice-cream, Carpenters, Mechanics. 1 to 8 H. P. Fuel, Kerosene. No dust. Automatic in fuel and water supply. Illustrated Catalogue free. See illustrated notice in Sci. Am. Aug. 4,1888. SHIPMAN ENGINE CO. 200 Summer St., Boston, Mass

With Dixon's Silica-Graphite Paint. It will cover two or three times more surface and last four or five times longer than any other paint. Not affected by heat or cold or acids. Send for circular,

JOS. DIXON CRUCIBLE CO., Jersey City, N. J.



t CO., in connection with the publi-TIFIC AMERICAN, continue to ex-, and to act as Solicitors of Patents

amine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had over forty years' experience, and now have unequaled facilities for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs, Munn & Co. also attend to the preparation of Caveats, Copyright for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, con-

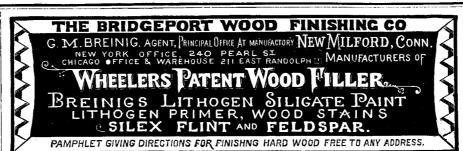
reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases. Hints on the Sale of Patents etc.

tents, etc.
We also send, free of charge, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

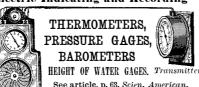
MUNN & CO., Solicitors of Patents, 361 Broadway, New York.

BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.



SAWS Wanted 50.000 Sawyers SAWS and Lumbermen to SAWS and Lumbermen to SAWS send us their full address for a copy of Emerson's IF Book of SAWS. We are first to introduce NATURAL GAS for heating and tempering Savys with wonderful effect upon improving their quality and toughness, we enabling us to reduce prices. Address EMERSON, SMITH & CO. (Ltd.), SBeaver Falls, Pa.

TELEMETERS. Electric Indicating and Recording



See article, p. 63. Scien. American, August 3, 1889. Send for manufacturers' catalogue t Standard Thermometer Co., Peabody, Mass., U.S.

THE COPYING PAD.—HOW TO MAKE and how to use; with an engraving. Practical directions how to prepare the gelatine pad, and also the antime the by which the copies are made; how to apply the written letter to the pad; how to take off copies of the letter. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 438. Price 10 cents. For sale at this office and by all newsdealers in all parts of the country.



CROSBY STEAM GAGE & VALVE CO. 93 Oliver St.

Send for New Illustrated Catalogue describing all Ma-chines. Largest stock in America. New or Second - hand Typewriters of all makes. Machines Rented in any part of the country. Supplies in abundance. Prices the lowest.

NATIONAL TYPEWRITER EXCHANGE, 161 La Salle Street, Chicago, Ill.

PULLEYS. Cheapest, Lightest, and Best, Made by Hardwood Split P. Co., Menasha, Wis.



THE ORIGINAL UNVULCANIZED PACKING

Plates. For sale by C. B. RICHARD & CO., SQL AMERICAN AGENTS, No. 3 East 14th Street, New York.

Steam! Steam!

Quality Higher, Price Lower.

2-Horse Eureka Boiler and Engine, - \$135

4- " " " - - 210
Other sizes at low prices. Before you buy get our prices.

B. W. PAYNE & SONS,

HARTFORD HER

NANCE SAFETY

warranted. Neither equaled. These floats never or fill with water. All sizes for any pressure,

Solderless Copper Floats

RELIANCE GAUGE CO. See Ontario St. RELIANCE GAUGE CO. Cleveland, Ohio.

THOMAS DEVLIN & CO. O FINE TINNING JAPANN IN AND THE LEHIGH AVE & AMERICAN ST. PHILA

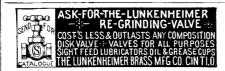
EIKONOGEN.

WATER COLUMNS

18 x 42 Harris Corliss Engine

Has been in use several years and will be sold cheap to make room for a larger one. In good condition.

Address HALL & CO., Jamestown, N, Y.



THE AMERICAN BELL TELEPHONE CO.

95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30th, 1877, No. 186,787.

The transmission of Speech by all known forms of Electric Speaking Telephones infringes the right secured to this Company by the above patents, and renders each individual user of telephones not furnished by it or its licensees responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.



SAFE BOILERS FOR AMATEUR WORK By G. D. Hiscox.—Description of several types of safe steam generators for the use of amateurs—the pipe coil boiler, the pipe boiler, pipe sectional boiler. With 3 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 702. Price 10 cents. To be had at this office and from all newsdealers.

ASSESTOS

Boiler Coverings, Millboard, Roofing, Building Felt, Liquid Paints, Etc. DESCRIPTIVE PRICE LIST AND SAMPLES SENT FREE. H. W. JOHNS MFG. CO., 87 Maiden Lane, N.Y.

NEW CATALOGU VALUABLE PAPERS

of charge to any address. MUNN & CO., 361 Brondway, New York.



ANNOUNCEMENT!

amproved methods and special tools make it possible for us to manufacture Elevators, to be operated from line of shafting, at a largely reduced cost.

Purchasers desiring a safe and motion which has a state of the safe and motion of the safe and motion. nne of shafting, at a largely reduced cost.

Purchasers desiring a safe and reliable Elevator,
which has stood the test of 37 years' use, should apply
to us for an estimate.

All our Elevator machinery is made of the very best
materials, and by skilled workmen.

materials, and by skilled workmen.
Also manufacturers of Hydraulic Passenger and
Freight Elevators.
OTIS BROTHERS & CO.,
38 Park Row, New York.

C HILLINGS & SPENCER CO.





TO BUSINESS MEN

The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be overestimated. Its circulation is many times greater than that of any similar jour nal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading rooms of the world. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. This he has when he advertises in the SCIENTIFIC AMERICAN. And do not let the advertising agent influence you to substitute some other paper for the SCIENTIFIC AMERICAN, when selecting a list of publications in which you decide it is for your interest to advertise. This is frequently done, for the reason that the agent gets a larger commission from the papers having a small circulation than is allowed on the SCIENTIFIC AMERICAN.

For rates see top of first column of this page, or address

MUNN & CO., Publishers,

MUNN & CO., Publishers, 361 Broadway, New York.



COMPTOMETER

Solved rapidly and accurately by using the Comptometer. Saves 40 per cent. of time. Entire relief from mental strain Adapted to all commercial and scientific computations. Send for circular.

FELT & TARRANT MFG. CO., 52-56 Illinois St. Chicago



THE

Scientific American

ESTABLISHED 1846.

The Most Popular Scientific Paper in the World.

Only \$3.00 a Year, including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions. Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture. Horticulture, Natural History, etc. Complete List of Patents each week.

Terms of Subscription .- One copy of the SCIEN-TIFIC AMERICAN will be sent for one year—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of three dollars by the pubshers; six months, \$1.50; three months, \$1.00.

Clubs.-Special rates for several names, and to Post

Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., pay-

MUNN & CO.,

361 Broadway, New York.

THE

Scientific American Supplement.

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith In size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers, and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geclogy, Mineralogy, Natural History, Geography, Archæology Astronomy, Chemistry, Electricity, Light. Heat, Mechanical Engi-Chemistry, Electricity, Light. Heat, Mechanical Engineering. Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Bioteches Medicine Agree Agreements my, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other pub-

The most important Engineering Works, Mechanisms. and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States and Canada, \$5.00 a year, or one copy of the SCIENTIFIC AM-ERICAN and one copy of the SUPPLEMENT, both mailed for one year for \$7.00. Single copies 10 cents. Address and remit by postal order, express money order, or check. MUNN & Co., 361 Broadway, N. Y.. Publishers Scientific American.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. \$2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming a large and splendid Magazine of Architecture, richly adorned with elegant plates in colors, and with other fine engravings; illustrating the most interesting exof modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best places for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Sheets of Details, Estimates, etc. The elegance and cheapness of this magnificent work have won for it the Largest Circulation of any Architectural publication in the world. newsdealers. \$2.50 a year. Remit to

MUNN & CO., Publishers,

361 Broadway, New York.

PRINTING INKS. THE "Scientific American" is printed with CHAS, ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Phila., and 47 Rose St., opp. Duane St., N. Y.