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

Vol. LXXVII.—No. 19. ESTABLISHED 1845.

NEW YORK, NOVEMBER 6, 1897.

\$3.00 A YEAR.
WEEKLY.

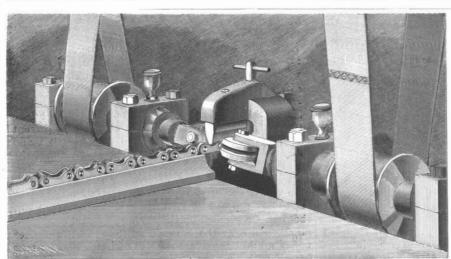


Fig. 1.-CHAIN RIVETING MACHINE.

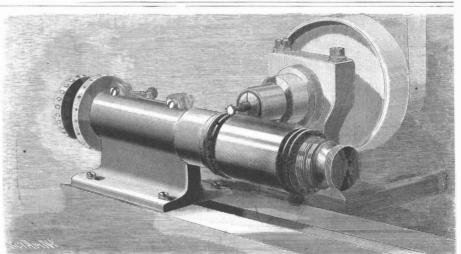


Fig. 2.-CUTTING SLOTS IN HUB FLANGES.

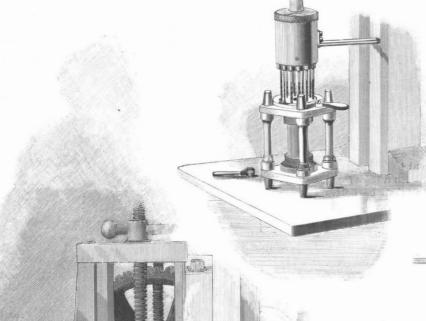


Fig. 4.-CHAIN LIMBERING MACHINE.



Fig. 5. SAWING OFF CHAIN BLOCKS. Fig. 3. DRILLING HUB FLANGES

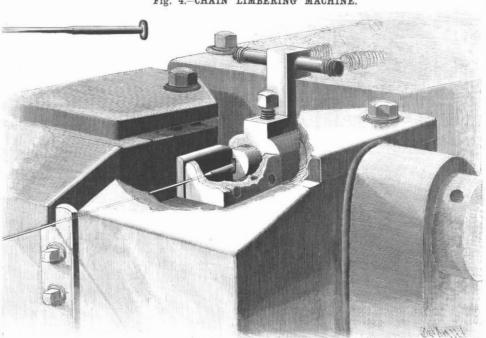


Fig. 6.-HEADING THE SPOKES.

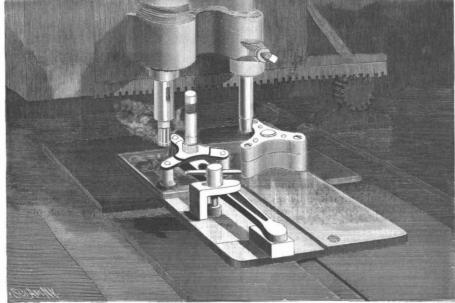


Fig. 7.-PROFILING THE SPIDER.

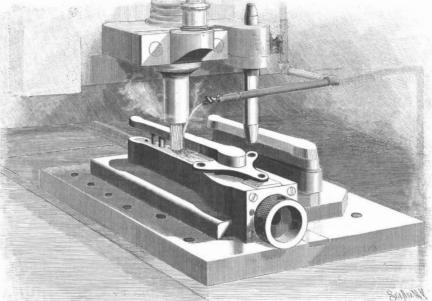


Fig. 8.-CRANK PROFILING MACHINE.

THE PLANT OF A MODERN BICYCLE FACTORY.—[See page 292.]

## Scientific American.

ESTABLISHED 1845

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

#### TERMS FOR THE SCIENTIFIC AMERICAN. (Established 1845.)

One copy, one year, for the U.S., Canada or Mexico. Remit by postal or express money order, or by bank draft or check MUNN & CO., 361 Broadway, corner Franklin Street, New York.

#### The Scientific American Supplement (Established 1876)

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 the U.S. Canada or Mexico. \$6.00 a year, or £1 4s. 8d. to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page. Combined Hates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U.S., Canada or Mexico, on receipt of seven doldars. To foreign countries, eight dollars and fifty cents a year, or £1 1s. 1ld., postage prepaid.

#### Building Edition of Scientific American. (Established 1885.)

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendidly illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To architects, builders, and all wao contemplate building this work is invaluable. Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, \$2.30 a year. To foreign countries, \$3.00 a year, or 20 12s. 4d. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, \$5.00 a year. To foreign countries, \$5.50 a year, or 25 63. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN, and SUPPLEMENT, \$3.00 a year. To foreign countries, \$1.00 a year, or 25 63. Aypostage prepaid.

#### Export Edition of the Scientific American (Established 1878)

with which is incorporated "LA AMERICA CIETTIFICA E INDUSTRIAL." or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Fyrumber contains about 100 pages, profusely illustrated. It is the finest scientific industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. \$3.00 a year, or 50 12s. 4d., postpaid to any part of the world. Single copies, 25 cents. MUNN & CO., Publishers, 361 Broadway, New York.

The safest way to remit is by postal order, express money order, raft or bank check. Make all remittances payable to order of MUNN Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, NOVEMBER 6, 1897.

(Illustrated articles are marked with an asterisk.)

Ant shelters 294	Net holder, Alling's*
Art bronze casting* 299	Notes and queries
Bicycle factory, a modern* 289	Patent issue, a record
	Patent Office reform wanted. 291-
Brake, bicycle, the Morrow 292	Patents granted, weekly record
Bridge renewal, rapid* 293	of
Car coupling, Smith's* 298	Photographic developer, diphe-
Chain riveting machine, a* 289	nal
Doane, Thomas, death of 295	Railroad disaster, Hudson River
Dynamite, firing by electricity 300	Railway, mountain, single rail*
Hub flange drilling, bicycle* 289	Salt habit, the
Hyposulphites, eliminating 298	Science notes
Inventions recently patented 300	Sociological experiment, a
Invention, what it has done 294	Spain and the United States
Ivory, history of	Spoke heading, bicycle*
Kite, Weather Bureau 294	Sugar and muscular exertion
Mills house, the new	Tallow tree, a new
Mosquitoes	Trolley wagon for country roads,
Nansen, arrival of Dr. * 297	
	a*
Navies of the United States and	Water power, the age of
Spain 290	Wax statuette moulding*

#### TABLE OF CONTENTS OF

#### Scientific American Supplement

No. 1140.

#### For the Week Ending November 6, 1897.

Price 10 cents. For sale by all newsdealers.

Tito to combination of an incompanion	
P	AGE
I. ASTRONOMY.—The Beginnings of American Astronomy. — A most interesting and important brief history of astronomy in America.—By Dr. E. S. HOLDEN, the late director of the Lick Observatory, Mount Hamilton, Cal.	18219
II. BOTANY AND HORTICULTURE.—Hibiscus Manihot.—I illustration	18219 18219
III. CHEMISTRY.—Detection of Tar Dyestuffs in Claret	18229
IV. CIVIL ENGINEERING. — The Trans-Siberian Railway.—This article describes the history and construction of this interesting railway, accompanied by illustrations, showing the construction by criminals, and the bridges on the line.—4 illustrations	18222
V. ETHNOLOGY.—The Worship of Meteorites.—A lecture by the late Prof. HUBERT A. NEWTON	18224
VI. MARINE ENGINEERING.—Paddle Engines with Joy Gear.—1 illustration	18227
VII. MECHANICAL ENGINEERING.—American Made Machine Tools.  Mill Set in Motion by an Ox or Horse.—I illustration.  New Gasoline Motors.—2 illustrations.  The Chime at St. Germain l'Auxerrois.—A new system for ringing bells mechanically.—2 illustrations.  The Kalamazoo Carrycycle.—A new form of invalid's chair.—1 illustration.	18227 18229
VIII. MISCELLANEOUS.—The East India Frontier Troubles.—4 illustrations	18221 18221 18221
IX. PHOTOGRAPHY.—Labels for Dry Plates.—Labels intended for travelers in foreign countries to prevent the opening of boxes of plates, and consequently fogging them	18228
X. SURVEYINGThe Bridges-Lee Photo-Theodolite1 illustration	18228
XI. TRAVEL AND EXPLORATION.—A Two Weeks' Trip With Eskimo Dogs.—By the Rt. Rev. JERVOIS A. NEWNHAM.—An interesting account of a trip in British North America.  The Grotto of La Balme.—3 illustrations.	18216 18218

I. WARFARE.—The Deterrent Influence of Modern Arms.—By Gen. O. O. HOWARD.—A critical examination of the effect of mod-ern arms as concerns the possibility of warfare.....

#### THE NAVIES OF THE UNITED STATES AND SPAIN-A COMPARISON.

In view of the somewhat strained relations which exist between certain sections of the press of the United States and Spain, and the rather thin ice upon which the diplomatic representatives of the two countries are just now venturing, a comparison of the fire guns. strength of the two navies will have more than a passing interest.

In looking over the lists of the ships, and noting the date of building, one is struck with the fact that both navies, though small, are of modern construction and thoroughly up to date. The period of reconstruction dates from the early eighties, and previous to that time neither nation possessed a navy which, judged by modern standards, was of great practical value. Spain could boast of two or three obsolete types of iron ships, armed with muzzle-loading guns, and a few small cruisers of slow speed carrying breechloaders of the slow-firing type; while the navy of the United States, though numerically stronger, consisted mainly of ships built some twenty years before and during the war between the North and South.

It is difficult to make a comparison of the two navies class by class for the reason that the most important warships of Spain are of a type midway between the battleship and the cruiser, which is not represented in displacement and 20 knots speed, with a complete 12 inch belt at the water line and carrying two 11 inch guns as the main armament. In respect to their high speed and unprotected upper works they approximate to the cruiser, while the great thickness of the belt and the barbette armor and the size of the main armament would rank them as second-class bat-

Comparing the two navies seriatin by classes, we find that the United States has a great preponderance in first-class battleships. Of these she possesses four, with an average displacement of 10,568 tons; average speed, 16:42 knots: thickness of belt armor, 18 inches of Harvevized steel, and a main armament of 13 inch guns. Against this Spain could oppose her one battleship, the Pelayo, 9,900 tons, 16 knots speed, 17% inch belt, and armament of 11 inch and 121/2 inch guns. The Pelayo is a French built ship, with a high freeboard, and its main battery disposed in four barbettes, two fore and aft and two on the broadside. She is a formidable ship, but would scarcely be a match for either of our battleships, except in a heavy sea, when her greater command would be a considerable advantage.

Spain has no second-class battleships to offset the four 10 inch guns; and the Texas, of 6,315 tons, 12 inch belt, 17 knots speed, and armament of two 12 inch guns, unless we reckon the Infanta Maria Teresa as belonging to this class, in which case Spain possesses a superiority of four ships. This would go far to offset our advantage in battleships of the first class. The high speed—20 knots—of these ships would give them a great tactical advantage over the Maine and the Texas, and would enable them to choose the fighting position in relation to our Massachusetts or Iowa which would expose them to the least damage.

In the armored cruiser class Spain could oppose one ship of 6.840 tons, 6 inch belt, 20 knots speed and armament of 10 inch and 6 inch guns, and one ship, the Carlos V, of 9,235 tons, 20 knots speed, 2 inch belt and armament of 11 inch and 51/2 inch guns, against our Brooklyn, of 9,250 tons, 3 to 7½ inch belt, 21.9 knots speed and armament of 8 inch and 5 inch guns, and New York, of 8,200 tons, 4 inch belt, 21 knots speed and armament of 8 inch and 4 inch guns.

The United States possesses six coast defense monitors of from 4,000 to 6,000 tons, 10 to 13 knots speed, and armament of 10 inch and 12 inch rifle guns. Spain has none of this class of ship, unless two obsolete iron vessels, the Numantia and Victoria, of 7,300 tons and 8 and 10 knots speed, armed with muzzle-loading guns, be included

In the protected cruiser classes the United States leads with the two commerce destroyers, Minneapons and Columbia, of 7,357 tons, 23 knots speed and great these, and neither her merchant marine nor navy could furnish a sea-going vessel that could overtake them upon the high seas. 'The Olympia, though not so large or fast, is more formidably armed, carrying 8 inch and 5 inch guns; at the same time she is credited with the high speed of 21.69 knots. Spain has no ship answering to the Olympia.

To the 4,500 ton cruisers of the Baltimore and Newark the Alfonso XIII. of 5,000 tons, and the Lepanto, of 4,826 inch guns and a battery of 4.7 rapid fire guns. The named.

3,000 to 3,700 tons, and three of 2,000 tons, most of bodily into the river. It became necessary to span

which have a speed of 19 knots and are armed with rapid-fire guns. To these Spain could oppose five cruisers of from 3,000 to 3,300 tons with a speed of from 14 to 171/2 knots. The latter cruisers were built between 1879 and 1887 and are not so fully up to date as our ships, which were built in the nineties and carry rapid-

The United States has seventeen gunboats and smaller cruisers of between 1,000 and 1,750 tons displacement and from 12 to 171/2 knots speed, as against four of the same class in the Spanish navy which range in displacement from 1,030 to 1,130 tons and are of 14 and 16 knots speed. Spain has also eighteen gunboats of about 550 tons displacement and from 11 to 20 knots speed, according to their date of construction.

Spain possesses two torpedo boat destroyers, fourteen first-class and three second-class torpedo boats, whereas we have three destroyers built and building, and eighteen torpedo boats under construction or completed, with one submarine boat.

From this brief review of the two navies it is evident that Spain is an antagonist who, in the present stage of naval affairs in the two countries, is by no means to be despised. Although she is second to the United States both in the number and power of her ships, her fleet would be effective for the class of warfare which she would probably elect to wage. It is our navy. Of these Spain possesses six ships, known not to be supposed for an instant that she would run as the Infanta Maria Teresa class, of 7,000 tons the risk of a pitched battle where she would meet such mighty ships as the Massachusetts or the Iowa. Her policy would be to avoid the line of battle and content herself with depredations upon our seacoast cities and our commerce. The great speed of her 7,000 ton armored cruisers would enable them to elude our battleships, and the range and great weight of the 11 inch guns which they carry would prove terribly destructive in long range bombardment.

If a war should prove to be protracted, the delay would be in favor of the United States, as we should soon put in the water the five first-class battleships and the torpedo boats now under construction; and this would give us a powerful preponderance. As matters now stand, however, Spain would undoubtedly be able to maintain for some time a fierce and destructive naval war.

#### THE DISASTER ON THE NEW YORK CENTRAL RAILROAD.

The fatal wreck of the Buffalo Express on the New York Central Railroad will go on record as one of the worst disasters in railroad history. In the practically complete demolition of the train, and in the long list of fatalities, it possesses all the features which used to Maine, 6,682 tons, 12 inch belt, 174 knots speed, and characterize the all too frequent accidents on the flimsy pioneer railroads of an earlier day; and the profound sensation which such a calamity always produces on both the lay and professional mind is, no doubt, greatly intensified by the fact that in this case it has happened upon one of the most solidly constructed and best equipped railroads in the world. In common with the Pennsylvania Railroad the New York Central has been generally accepted as the representative railroad of America, and the fame of its four-track line with its hundred-pound rail, heavy ties, broken stone ballast and solid roadbed has reached every corner of civiliz-

The scene of the accident lies in the Highlands of the Hudson, and therefore in the midst of some of the most noted natural scenery of that famous river. At this point the lines are carried on an embankment on the outside of which is a dry retaining wall, that is to say, a wall in which the stones are laid upon one another without any cement to bind them together. Judging from the evidence, it would seem that when the Buffalo Express reached this embankment a portion of it collapsed, and the wall, together with that half of the roadbed covered by the southbound track, slid off sideways into the river. The engine and seven cars, including three sleepers, plunged into the river, with the result that a score of passengers lost their lives, chiefly by drowning, and a large number of others were injured.

Travelers who have passed through the Hudson Valley at this point will remember that the river is closely coal endurance. Spain has no warships answering to hemmed in by the mountains and foot hills, which often descend precipitously to the river or slope to the water's edge and beneath it at various angles of inclination. In some places, the roadbed through the Highlands consists largely of "cut" or "fill," that is to say, it is either cut from the hillside or consists of an embankment hugging the shore line at the base of the sloping rock, or thrown across the mouths of the small gulches and valleys which run down between the hills types, of which we have six, Spain could only oppose to the river. The construction of this line took place so many years ago that accurate records are not availtons, both of 20 knots speed and armed with 6.2 and 7.8 able; but that the engineers met with serious difficulty in the Highlands is probable, judging from the expesuperior size and delivery of shell fire from the rapid rience of the builders of the New York, West Shore fire guns of these two ships would make them formida- and Buffalo Road along the opposite bank of the river. ble antagonists of any two of the six boats above Here the dip of the rock beneath the river was frequently so steep that the rock embankment and even The United States also possess five cruisers of from the cribwork could not obtain a foothold, and slid off such places with costly steel bridges, two of the most notable of which are located respectively below Cozzens' Hotel and just below Fort Montgomery. The former is 210 feet long and the latter 290 feet, and they are only two instances out of many where this expedient had to be used. Illustrations of this work and a description of the difficulties of railroad building in the Highlands were given in the SCIENTIFIC AMERI-CAN of January 26, 1884.

We refer the reader to these facts because they suggest a probable explanation of the recent disaster on the opposite side of the river. An examination of the site shows that the natural surface of the rock dips abruptly toward the river. The original single track roadbed was constructed about half a century ago. Subsequently a second track was added on the river side and a retaining wall, laid dry, was built up, which acted both as a sea wall to protect the embankment from the wash of the river and as a retaining wall to hold the material of the roadbed in place. That it had to do the work of a retaining wall is evident from the fact that the filling was carried up to the top of the wall, which would therefore be subject to the lateral thrust of the embankment.

The fact that the embankment has carried the traf fic safely for forty years has led the company to suggest that some violent external cause, such as a de railed engine or dynamite in the hands of malicious parties, caused the wreck. But while the long continued stability of the roadbed makes its sudden collapse more puzzling, it cannot be taken as proof that the wall carried a sufficient margin of stability through all these years. If the friction between the roadbed filling and the sloping surface of the underlying rock was sufficient, but only just sufficient, to hold the embankment in place, it only needed the saturation of the material by exceptionally high tides—such as were occurring at this time-and the concussion of a heavy express train to start the slide.

The New York Central holds a well merited reputa tion for the excellence of its roadbed and equipment. If the careful examination which is being made shows that the wreck was due to the cause above suggested, it is probable that a regard for its own interests and those of the public will lead the company to reconstruct its embankments in all places where the shelving rock may imperil the safety of the roadbed.

#### AN INTERESTING SOCIOLOGICAL EXPERIMENT.

An interesting sociological experiment has been inaugurated in New York City. The housing of men in moderate and reduced circumstances has always been an interesting and important problem. Many attempts have been made in that direction, but in nearly every instance the buildings have been so arranged that they did not attract a desirable class of people, or the architecture, decoration—lack of decoration-or general effect was to give the house an institution-like appearance, with no semblance of refinement, comfort or home. Mr. D. O. Mills was interested in this problem, and at last resolved to venture a large fortune in the erection of a superb hotel for men with small incomes. In the beginning it must be said that there is no charity connected with "Mills House No. 1" on Bleecker Street, New York. The man pays for what he gets, but unlike the frequenter of the ordinary lodging house he gets all he pays for. He has a clean, comfortable room, furnished with a well appointed bed, the floor carpeted and the windows curtained and shaded, for twenty cents a night. Well equipped lavatories, shower baths and luxurious reading and smoking rooms are at the disposal of the guests of the house without extra charge. A good restaurant furnishes meals at the lowest possible price.

Lodging houses in the lower part of New York will not suffer by the opening of the Mills House, because the class of men who frequent them will not be entertained there, but it is expected there will be enough men in moderate circumstances who desire a comfortable home at a minimum price to fill the 1,560 rooms which the house contains. So satisfied is Mr. Mills of this that he is now erecting on the east side a similar building at Rivington and Clinton Streets. Mr. Mills, who is a very successful man of affairs, may be trusted to make no failure in an investment of this kind. Unfortunately, philanthropy is usually divorced from business principles, and the mischief that this does is incalculable, and the result is often that the masses are pauperized, whereas they might be benefited and made self-respecting by enabling them to help themselves. The use of wealth for bettering the conditions of life under such circumstances as will secure to capital its due return is a beneficent experiment which has hitherto been imperfectly tried in New York or elsewhere.

The Mills House No. 1 has a frontage of 200 feet on Bleecker Street. It is ten stories in height and is built of white brick and Indiana limestone. The architect is Mr. Ernest Flagg, who has been entirely successful in designing this hotel. The house is built in two parts, each in the form of a hollow square with two that every one of them relates to the same subject, courtyards reaching to the top and ending in skylights. namely, improved ways of constructing and operating These courts are lighted and heated and comfortable switchboards for telephone exchanges. The final govchairs are provided, and each court is ornamented with ernment fee on these cases amounted to \$2,500. This of the same sort."

palms and plants. The windows of the sleeping rooms on the court give light and air, and are provided with grilles and lace curtains, no window glass being used. The rooms on the outside of the building have windows and curtains. The various floors are reached by means of elevators. The rooms are, of course, very small, just large enough to contain a bed and a chair. They are all separated, however, and are lighted over the partition, there being no lights in the rooms. Though the rooms are not luxurious, they are very comfortable. No better bedding can be found in any hotel in New York. Lockers in the basement allow for the storage of the effects of the guests.

The entire front on Bleecker Street is occupied by a series of tastefully decorated parlors which would not disgrace a first-class hotel. A large collection of wellselected books is already in place. Great washrooms are provided with hot and cold running water. The most modern form of baths with hot and cold water are free to all guests. A laundry is provided in the house, and the men may, if they desire, wash their own clothes, facilities being provided for this purpose. The dining room is in the basement and is intended to furnish cheap meals of a good quality.

The Mills House No. 1 was opened on Wednesday, October 27, in the presence of a large number of invited guests. The exercises included a prayer and address by Bishop Potter, of the Diocese of New York, and addresses by Ex-Mayor Abram S. Hewitt and Dr. Chauncey M. Depew. They all spoke warmly in favor of such a use of capital, which does not pauperize old or young men, but which tends to make them self-respecting. The erection of a building of this kind is indeed the truest kind of philanthropy.

#### AN URGENT PATENT OFFICE REFORM.

We recommend to the careful perusal of our readers the admirable letter upon the question of Patent Office reform which will be found elsewhere in this issue. The high authority from which it proceeds and the unanswerable arguments with which it abounds should serve to bring home to the inventors and manufacturers of the country the urgent necessity for combined action. with a view to securing the necessary reforms at the forthcoming meeting of Congress.

The wearisome delays of which such correspondents as Mr. Heath have from time to time complained are not more harassing to the inventor than they are to the various Patent Office officials, whose hands have been tied and whose best efforts have been crippled by the parsimonious policy of Congress in the matter of appropriations. This parsimony would be more intelligible if the Patent Office were a losing investment for the government; but in view of the fact that this department is netting the government a clear \$300,000 a year and that there is a neat surplus of \$5,000,000 to the credit of the Patent Office in the Treasury, the reluctance of Congress to grant the modest requests of Commissioners for an increased appropriation is a crying injustice both to the inventors and the overworked staff

The request for more generous appropriations is so reasonable that the failure of Congress to grant it can only, we think, be due to indifference or want of information as to the workings of the Patent Office. The surest remedy will be for the great body of inventors throughout the country to make the matter a personal one—as it surely is—and bring their individual and united influence to bear upon the senators and representatives with whom they are personally acquainted.

In pleading their case and that of the Patent Officethe two are identical-we do not know of any better brief to put into their hands than the clear and forceful letter to which reference is herewith made.

#### A RECORD PATENT ISSUE.

The simultaneous issue of one hundred and twentyfive patents to a single individual has caused The Patent Office Official Gazette of October 27, 1897, to assume proportions which make it by far the largest of its kind ever issued. Up to this date the largest issue of The Gazette contained 194 pages. The present issue contains 288 pages. In making it up the Norris Peters Company, according to the Washington Star, used 250 reams of paper and made 252,000 impressions, the usual number of impressions for The Gazette being 140,000. To meet the emergency the government printing office had to telegraph for extra type, and sixty extra men were put upon the work.

The increased bulk of the issue is due to the insertion of the batch of 125 patents above mentioned to Milo G.Kellogg, of Chicago, Illinois, who has assigned the whole set to the Kellogg Switchboard and Supply Company, of Chicago.

The application for the first of Mr. Kellogg's patents was filed April 27, 1887, and the others followed at intervals up to March 9, 1895, which is the date of the last of the 125 applications. A remarkable feature is

constitutes the largest check ever paid into the Patent Office at one time for government fees, and it is almost needless to add that the 125 patents is the largest number ever issued at one time to one inventor.

Apart from the interest which attaches to the Kellogg patents, on account of the features above mentioned, they should serve to remind inventors of a fact which they too often overlook, but which sometimes seriously affects the value of their patents. We refer to the disinclination of the average inventor to file applications for modifications. Too often they are content to lay stress upon a particular form of the device, and merely make mention of its various modifications, whereas the modifications should form the basis of separate applications. It is only in this way that the inventor can secure the most complete protection. Mr. Kellogg has carried out this principle to its fullest extent, and while there will probably be few subjects that will call for anything like the same number of applications, this notable issue is an object lesson which may be commended to the thoughtful consideration of inventors at large.

#### THE AGE OF WATER POWER.

It is stated that during a recent interview in Canada Lord Kelvin asserted his belief that the time would come when the greater part, if not all, of the waters of Niagara would be utilized for industrial purposes; and that on being asked if he would not regret the loss of the grandeur and beauty of the falls which would result, he stated that in view of the vast industrial benefit to be gained, he would not regret it. Whether the distinguished scientist was correctly reported or not, there are good grounds for believing that the future will see the new, or rather newly developed, source of energy utilized for industrial power purposes to a degree that will make it only less universal than coal and the steam engine. Time was when water was the leading source of energy for the power necessary to drive the machinery of mills and factories: but the cumbersome and otherwise unsatisfactory nature of the old under or overshot wheel, and the necessity for locating the factories where the power was generated, was a severe drawback to its usefulness. The introduction of steam, with its advantage of being generated whereever the factory might be situated, led to the disuse of water power in almost all cases where coal was avail-

The advent of the dynamo and the motor opened a new and wider sphere of usefulness for water power. It gave to it something of the mobility of steam power, and unwound the chains which had tied it down to the banks of the rivers and streams. The water wheel gave place to the turbine, and electrical transmission has carried the silent energy to distant cities and the scattered centers of industry. And who shall place a limit to the distance that may be covered? The recent developments of electrical science point to the possibility of transmitting the stored energy of our rivers and waterfalls to vast distances with but a trifling loss; and with the improvements which analogy teaches us to expect in this comparatively new branch of engineering, we may look for its successful competition with steam in districts far removed from the source at which the power is generated. When this time shall come, it is quite conceivable that Niagara will be depleted of its waters, if the authorities are so utilitarian as to allow it.

The statistics of the present state of the art show that it is advancing with rapid strides. America leads the world with a total installation of over 70.000 horse Switzerland comes next with 32,000 horse power. France has 18,000 horse power, and the great power plant at Rheinfelden, Germany, will give Germany the fourth place with about 17,000 horse power. Italy has nearly as much, and Norway and Sweden are each credited with 15,000 horse power. In Great Britain there is a total installation of about 4,000 horse power. These figures suggest that the development of its water power may have a powerful influence in rearranging the centers of industry throughout the world. With the exception of the United States, the best natural water power is located in countries that are deficient in coal beds, and, on the other hand, the leading manufacturing countries, as a rule, are deficient in water power. Switzerland, Italy, Norway and Sweden have in the new system a powerful ally that will assist to bring them well to the front as industrial nations. To the United States, which already possesses enormous deposits of coal, the full development of her natural water power will mean the more speedy coming of that commercial supremacy which is already well within its

L'ELECTRICIEN, Paris, quotes from the Optician, London, an account of an invention by a man named Wilcox, in which a minute incandescent electric lamp is fastened to a pen near its point in order to illuminate the writing. "A little reflector," it says, "placed behind it, prevents the light from dazzling the eyes and directs it toward the paper. This arrangement. may be applied also to a pencil or to any instrument

#### A TRIP THROUGH A LARGE BICYCLE FACTORY.

We think that few of the readers of the SCIENTIFIC AMERICAN have an adequate idea of the time and money expended in the manufacture of what is case of a 20,600 mile ride, in which an Eclipse wheel known as a truly high grade bicycle. It is difficult to realize that there are altogether more than nine hundred separate parts to one of these popular machines, and when we see this large number of intricate parts brought together and formed into a symmetrical machine, weighing only twenty-four or twenty-five pounds, and possessing sufficient strength to drawn to the Morrow hub, a special form of which has

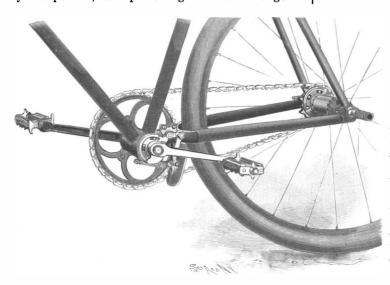


Fig. 9.-THE MORROW BRAKE.

carry a heavy man over country roads for thousands on a special machine. The steel wire is first upset, of miles without sign of failure, we realize the great then headed, and finally the bur is sheared off. The perfection to which the manufacture of the wheel has advantages sought in this design are strength, ease of attained.

In the earlier days of the industry the bicycle was frequently manufactured in the machine shops of establishments where it formed only a small part of the output, and the bicycle parts were manufactured by the use of such tools as the shop possessed. But as soon as the industry began to assume its present proportions, manufacturers realized that special efforts must be made to keep pace with the demand and meet a competition which was evidently going to be fierce and sustained. They bent their energies to the construction of special tools and machinery for the more rapid, accurate and cheaper execution of the new class of work. So thoroughly have the old methods been changed that, with few exceptions, the best known devoted to bicycle manufacture, and are equipped from end to end with tools that have been specially designed for this purpose.

In the present article we illustrate the design and manufacture of the modern bicycle as carried out at the factory of the Eclipse Bicycle Company, Elmira,

It should be noted, in the first place, that this firm

one of these wheels carrying a load of sixteen men at one time, and, as an evidence of the durability of its machines, the firm quotes with pardonable pride the carried its rider round the entire circuit of the United

To follow out the whole process of building a bicycle would require more space than is practicable, and it will be sufficient to select some of the most important and novel features of this particular machine. Attention is

> been designed to match the direct T-headed spoke which is used on this machine. The desire to attach the spoke to the hub without a bend has led to a variety of ingenious devices, and the accompanying illustrations show the details of one of the most successful efforts in this direction. The hubs, which are made from a solid bar of steel, have flanges turned on each end. The piece is then placed vertically in a gang drill, and the holes for the spokes are drilled through each flange. This machine carries as many drills as there are holes in one flange. The hub is then taken to a milling machine, where a slot is cut from the periphery of the flange to every alternate hole of each pair of inside flanges. These slots are cut so that they will be at right angles to the direction of the spokes. The T-headed spoke is inserted by passing the head down the slot and pushing it sidewise into the opposite hole in the adjoining flange. The heads are formed in three operations

adjustment (obviating the necessity of taking the wheel out of the frame, in order to put in a spoke), and a tangential pull which will bring no bending strain on the spoke itself. On the front page of this issue will be found illustrations of the machines specially built for the making of the hubs and spokes.

Illustration No. 6 shows the machine for the upsetting and forming of the head; illustration No. 2 shows the machine for milling slots in the flange of the hub, and illustration No. 3 shows one of the gang drills that bores the necessary number of holes for the spokes, this gang of drills boring the entire number of holes at one operation.

Particular care is taken in the manufacture of the bearings. The cones and cups are turned from solid wheels are now built in factories that are exclusively bars of a special high grade tool steel, and after being the neat appearance and smooth finish of a keyless

the bearing will be adjusted just  $\frac{1}{1000}$  inch. The ring is kept in place by a dust cap which snugly incloses the end of the hanger, as shown in the cut.

This company has not followed the fashion of divided crank axles, believing that it is not a sound policy, judged on mechanical grounds. The cranks, which are square, fluted and slightly tapered, are carefully oil tempered. The right crank is formed in one piece with the clover leaf (as the spider is named in this wheel) and the crank axle. Forgings are finished in special machines, two of which are shown at work "profiling" a crank and a spider. The profiler is one of the many ingenious and time-saving machines used in this works. The forging, of whatever design, is fastened to a sliding table on which is fixed a pattern of exactly the

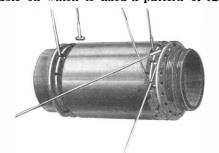


Fig. 10.-FRONT HUB, SHOWING METHOD OF ATTACHING SPOKES.

same size and shape as the piece is to be. The sliding head carries the vertical cutter and also a vertical pin which bears against the pattern or "former," as it is called. The distance between the "former" and the work being the same as that between the guiding pin and the cutter, it is evident that the latter, in passing around the rough forging, will cut it out to the same profile as the "former."

The Eclipse Bicycle Company favors, as we have said, the continuous axle, the right crank and the axle being in one piece. The left crank is attached by a very neat and effective device, the details of which are shown in Fig. 12. The end of the axle, which is threaded, is milled out so as to leave an inclined surface adapted to receive the flat side of a small key. A small projecting web or key, of metal, is left on the axle, which engages a transverse slot on the key and locks it in the crank. The key is not tapered and it fits snugly in the crank in the same position as the ordinary tapered key; but, unlike the latter, its ends are flush with the surface of the crank. Crank and key are pushed on over the end of the axle and an annular lock nut is then screwed on, wedging the crank tightly in place. It has all crank.

Two of our illustrations show the manufacture of the chain, a work to which the company devotes special care. Fig. 1 shows the process of riveting the pins. This is done by two opposite and swiftly revolving pairs of steel disks, the axis of revolution, as will be seen from the cut, being transverse to the axis of the disks. The latter are held in two jaws and are free to

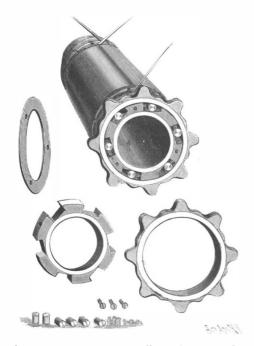


Fig. 11.—THE MORROW HUB AND DETAILS OF SPROCKET CLUTCH.

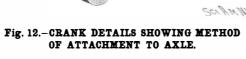


Fig. 13.-HANDLE BAR ADJUSTMENT.

Fig. 14.-ADJUSTMENT OF CRANK HANGER BEARINGS.

builds its bicycles "from the ground up," all such parts | carefully tempered in a lead bath, they are drawn to | rotate on their axes. The inner edges of the disks are as pedals, chains, hubs, cones, shells, and even the saddles being manufactured on the premises. Every nut, large and small, is turned from solid bars of steel, and the distinguishing characteristics of the finished wheel, at which the makers have aimed during adjustment of the crank hanger bearings will commend the past few years, are strength and durability. In itself to all wheelmen who have trouble on this score, the years when the craze for lightness was at its height, That the policy was productive of a remarkably strong in the barrel of the crank hanger. By removing the they receive in the friction of the limbering mamachine is shown by the well known illustration of | ring and turning the cup the space of only one notch,

temper in oil and then inspected, ground, and polished. The bearings are rendered dustproof by the method of bevel groovings, which tends to work the dust out of rather than (as is often the case) into the bearings. The The cup is provided with a notched periphery, and this wheel was maintained at the reasonable weight associated with this is a loose ring with three projecting which is now the standard for the average bicycle. | lugs which reach across the notches and engage recesses

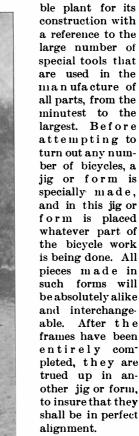
beveled so that, as the two sets are pressed together on the ends of the rivet, they upset them and form the desired heads. Another of the many machines concerned in the manufacture of the chain is shown in Fig. 5, where the chain blocks are being sawed wholesale from a bar of steel which has been rolled to the special figure 8 section used by this company. A gang of twenty saws is used on one shaft and the cutting is done so cleanly that the blocks require no further finish than chine. The chains are made from a special grade of chain steel, and, after being carefully hardened, they are put | lar recesses whose bottom faces are not tangent to the in the chain limbering machine, Fig. 4, which consists | periphery but slightly inclined. In each pocket or recess of a series of large and small sprockets, over which they is a hardened steel pin whose diameter is less than the are run at a speed of 500 revolutions per minute under a depth of the rear wall of the pocket but greater than machine. tension of 50 pounds. After being tested under a pull the depth of the front wall. The pins are pressed into

of 1,000 pounds in the testing machine, the chain is ready to be put on to the bicycle.

Many of the Eclipse bicycles are fitted with the Morrow brake, which avoids the objectionable features of the ordinary plunger brake, and which gives the wheelman full command of his mount on the steepest hills. Moreover, it enables him to hold his pedals stationary for the purpose of coasting. The mechanism consists of a friction clutch on the rear hub, another clutch on the left crank, and a spoon brake controlled by the latter. In the normal position the rear sprocket clutch is locked and the crank clutch is

side, thus securing an even hold upon the handle bar. The device is very efficient and is marked by the neat appearance that distinguishes the various parts of this

We close our notice of this machine and the admira-



One cannot go through an establishment such as

minutest to the largest. Before attempting to turn out any number of bicycles, a jig or form is specially made, and in this jig or form is placed whatever part of the bicycle work is being done. All pieces made in such forms will be absolutely alike and interchangeable. After the frames have been entirely completed, they are trued up in another jig or form, to insure that they shall be in perfect alignment.

the Eclipse Bi-

contact with both the disk and the sprocket by coiled cycle Company's and see the close work, rigid inspecmachines, and not be impressed with the great skill and care, and the elaborate plant, required in the construction of the modern bicycle.



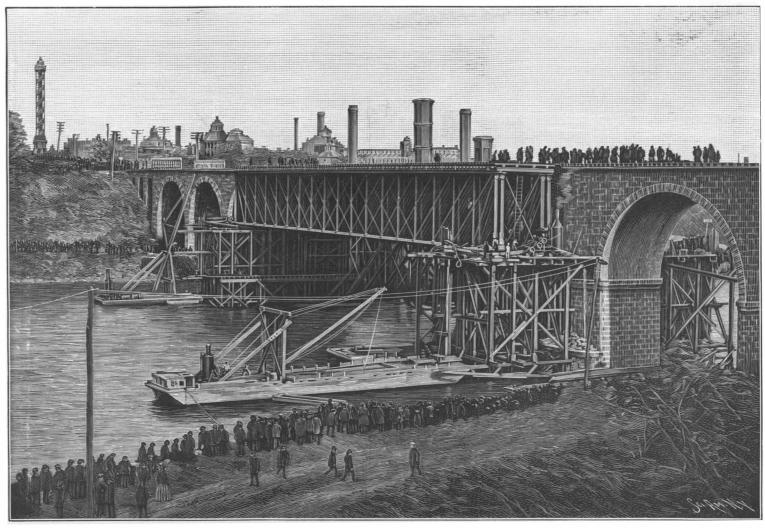
free. If it is desired to coast, a slight back pressure on the pedals releases the sprocket clutch and allows the rear wheel to run independently of the chain and cranks. To set the brake all that is now necessary is a rather sudden application of back pressure to the pedals. This sets the crank clutch. The external ring of this clutch is provided with a projecting arm which is pivotally connected to an arm on the spoon brake. By pressing is kept in place by a couple of covering flanges, one down on the pedals the ring is turned backward and of which is shown in the accompanying engraving. the brake is set against the wheel with any pressure desired. It will thus be seen that the rider can coast

springs. When the sprocket is pulled forward by the tion of all parts, the vast number of labor saving chain, the pins also roll forward and become tightly wedged, locking the sprocket to the wheel. On the other hand, when the pull of the chain is reversed, as in back pedaling, the pins are released and the wheel is free to rotate independently of the sprocket. The sprocket

The neat appearance and simple handle bar adjustment used on Eclipse bicycles is an attractive feature.

#### A RAPID BRIDGE RENEWAL.

A remarkable record for rapid bridge renewal was made by the engineers of the Pennsylvania Railroad Company on Sunday, October 10, when a large iron structure on the busiest part of that road was taken or set the brake by varying the back pressure upon The fork head is split and threaded. Upon this are away and a new span put in its place in the remarkthe pedals, and the leverage is so greatly in his favor screwed three threaded sleeves, the middle one of which able time of nine minutes. This feat was performed on



A RAPID BRIDGE RENEWAL-THE OLD SPAN REMOVED TO TEMPORARY FALSEWORK.

that he can stop the rear wheel altogether in cases of carries a threaded stud. A loose sleeve is passed over the bridge which crosses the Schuylkill River, carrying emergency.

the stud and bears upon the outer sleeves above men- the tracks of the New York branch over that beautiful The sprocket clutch, Fig. 11, consists of a steel disk tioned in such a way that when the nut is tightened stream just above Girard Avenue, Philadelphia. The upon which the sprocket is free to rotate. Around the the outer sleeves are pressed against one side of the approaches of this structure are of the most substantial periphery of the disk are cut out half a dozen rectangul fork stem and the center sleeve against the opposite stone work, and a long metal span stretches across

the river, connecting the arches on either side. The original span was placed in 1868, and as latterly it has not been considered strong enough to sustain the weight of the heavy traffic which is now sent over this line, it was decided to renew it. With this end in view a new span was built on a construction of false work which had been raised on the south side of the bridge. Another false work was also built to the north side. In the river, also to the north, two floats, with a dummy engine on each, were anchored and two other auxiliary engines were placed on the false work at either end of the span. Sunday afternoon was fixed as the most available time to make the exchange of spans, as the business is much lighter on that day. The Chestnut Hill train due at this point at 2:17 was not off the bridge yet when the work of dismantling was commenced at the other end. The track connections were quickly cut, and at a signal both the new and the old spans were raised simultaneously by hydraulic pressure. Another signal was then given for the engines to pull. In exactly two minutes and twenty-eight seconds the change was made and the new iron work slipped into its permanent resting place. It was only the task of a few minutes more to complete the track connection again, and in exactly nine minutes after the passage of the Chestnut Hill train the special car of Superintendent Brooks went smoothly over the bridge without a hitch. Then a couple of heavily ballasted freight trains were rolled back and forth over the bridge tracks as a test, and, having withstood this trial, the structure was declared ready for regular work.

The new span, which is constructed entirely of steel, is 240 feet long, 25 feet wide and 30 feet high. It is known as a Pratt truss or a single intersection quadrangular type of bridge. The old span was of the Linnville or double intersection type, and with its castings weighed 750 tons, while the new span is 200 tons heavier. The two were fastened together and moved at the same time, so that the entire load was 1,700 tons. The new span was built by the Edgemoor Iron Company, but the work of putting it into place was performed wholly by the men of the Pennsylvania Company.

The plans for accomplishing this great work were devised by Joseph T. Richards, the engineer of maintenance of way of the railroad company. They were executed under the supervision of Chief Engineer L. H. Barker and Assistant Chief Engineer L. W. Allibone, of the United Railways of New Jersey division; George Mershon, the veteran master carpenter and bridge builder of the same division, and his son, W. H. Mershon. Several weeks were consumed in the making of these preparations, as the greatest care had to be exercised and every possibility figured out to a nicety. A single mistake meant disaster and possibly serious interruption to the road's business. To avert any such trouble as this, each workman was given a particular duty to perform, and the success of the work attests the excellence with which the orders given were car-

Bridges have been moved before by the same methods, but heretofore the change has occurred on very small structures on the less frequented parts of the road. Never before has so massive a bridge been removed in so short a time.

#### Kite of the Weather Bureau.

The latest achievement of the Weather Bureau's scientists is the successful flying of a new cellular kite which presents a surface of about 70 square feet to the wind and balances itself at a height of one and a half miles. As in the other kites now used for upper air observations, the spruce framework is joined together with wires instead of nails, while the white muslin covering is as durable as the black silk used in the earlier forms of scientific kites, and much cheaper.

The big kite is rectangular in shape like the Hargrave flier, but the details of its construction are very different and it is altogether superior to the Australian

Much time and labor have been expended in condensing the apparatus for recording atmospheric conditions to the minimum weight, which is but 2½ pounds. The anemometer is attached to a truss which projects forward from the topmost support of the front cell. The meteorograph is at present lashed to the lower side of the center truss, but as its being beneath the kite endangers its safety in descending, this delicate instrument is in future to be fastened where the framework will lessen the chances of injury.

Not having time to supervise personally the experiments made with kites, Mr. Potter long ago relegated that branch of the Weather Bureau's work to C. F. Marvin, Professor of Meteorology. The latter gentleman has said in relation to the flying of kites at the very greatest elevation: "If we could employ a string or wire having no weight, and so fine that the wind pressure upon it would be wholly inappreciable, then, as more and more of this wire is paid out to it, the kite would pass outward and upward along the same straight line, retaining always the same angular elevation. A kite could be flown to an unlimited height under such circumstances, provided the wind remained unchanged. Unfortunately, however, we cannot fly kites stated by its superintendent, by means of the inven-subject.—Popular Science News.

with wire having no weight and against which the tions and improved appliances they have adopted, wind will not press; and, in consequence, our actual kite behaves in a very different manner from that described above."

The necessity for using a string which, like the other materials in their respective elements, would combine the greatest strength with lightness, will be plainly seen from the foregoing quotation.

Very fine steel wire was selected because it was strong enough to prevent a kite breaking away, and weighed but five pounds to the mile. As three miles of wire are required for an elevation of one mile, the total weight sustained by a kite at that altitude, including the recording apparatus, would be about 17 pounds, or 25 pounds at a height of one and one-half miles, which is the limit of ascent as yet attained by a Weather Bureau kite.

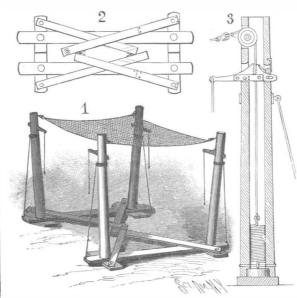
This wire is cut in lengths of 7,000 feet, and after each thousand is reeled out the flight is arrested until the inclination can be determined by focusing telescopes upon a scale marked in black ink upon the inner surface of the white muslin covering.

When a kite has risen above the treacherous undercurrents of air, it is out of danger until, in descending, it strikes the breakers again.

A number of kites are sent up from the flying grounds near Washington every windy day, a small engine being used for paying out the wire.

#### A NET HOLDER FOR USE AT FIRES.

The illustration represents a life saving device which may be folded to occupy but small space when not in use, but which may be quickly and conveniently set up, as shown in Fig. 1, to support a net, mattress, or bed in position to receive a person jumping or falling from a burning building. The construction is such



ALLING'S NET HOLDER FOR USE AT FIRES.

that the receiving surface yields under the weight of the falling body, the net or bed being thus forced downward, but there is no rebound, the net being afterward restored to its upper or normal position by those present. The improvement has been patented by Samuel A. Alling, of Homer, Minn. Fig. 2 shows the base of the device folded and Fig. 3 represents a vertical section through one of the posts. In the lower part of each post a spring is secured by means of a pin at its lower end, and from the upper end of the spring a cord extends up the hollow post and over a pulley to a hook or clip connection with a net or mattress. Near the upper end of each post are opposite openings, in one of which is fulcrumed a lever having on its inner end gripping teeth, while in the opposite opening is pivoted a spring-pressed gripping arm, the lever and gripping arm forming a clutch through which passes the cord from the spring to the net. This clutch permits the outward movement of the cord as the spring is extended by the force of the body falling on the net, the springs thus cushioning the fall, but the return movement of the cord, or rebound by the springs, is prevented by the action of the clutch in each post. After the body has been removed from the net, however, the clutch in each post is released from engagement with the cord by pulling upon a downwardly extending release cord attached to the outer end of the lever member of each

#### What Invention Has Done.

What is it that enables an operative to-day to produce so much more in a less number of hours than he could thirty or forty years ago? It is simply invention, as embodied in the improved machines, tools, processes and appliances that American inventors are constantly furnishing to American manufacturers.

Near Baltimore there was recently erected one of the largest plants in the world for the manufacture

they are enabled to produce a ton of steel with but one-third of the manual labor required at their other establishment, built twenty or twenty-five years be-

In 1866 steel rails cost \$165 per ton. In 1884 they had dropped to \$34, in 1893 they were \$21 to \$24 per ton, and in 1897 even less. See how that has expedited the building of railroads, which now cover the country like a network, and without which modern enterprise could not be carried on. And the same is true of steel in all its forms. So that to-day we build steel bridges, steel vessels, steel cannon, steel frames for our buildings and for farm implements, and use steel nails.

Inventions and improvements have so reduced the cost of steel rails that already, during the year 1897, the United States have sold 100,000 tons to Europe. -Engineering Magazine.

#### Ant Shelters.

BY GEORGE M. BROOKE.

One morning in early summer, several years ago, I was admiring from a distance a beautiful Virginia creeper, the young and graceful shoots of which, covered with fresh green leaves, adorned the weatherworn panels of an old board fence. A nearer view revealed the young shoots covered with brown aphides (plant lice), attended by busy ants. These were ants belonging to a common species, although I am ignorant of their scientific name. They were small, and dark brown in color, with short, sharp pointed bodies and short legs. The species, when excited or disturbed, has the peculiar habit of bending the abdomen upward to a vertical position; running hither and thither with it thus elevated, so long as disturbed. It is quite common to see these ants traveling on fences, in long lines; some moving in one direction, some in the opposite, passing each other, going and returning. Their nests are found in rotten timber, as in the decayed trunks and stumps of trees, in old fences, or in piles of [refuse wood.

While watching the ants and aphides, my attention was arrested by some small gray structures sticking to the panels of the fence. Each was pierced by one or more small apertures. These structures, while not symmetrical, had all more or less the form of flattened domes, varying in width and length from one to onefourth inch, with an average height of the eighth of an inch. Breaking one open, I discovered within it several ants of the species I saw milking the aphides. Soon I noticed numbers of them running in and out of the apertures of some of the little structures. I was at first declined to believe that these little gray houses were real ants' nests, but I knew from observation that these ants lived in holes and cavities in rotten timber. On close examination, no sacs were discovered, and none but worker ants were visible. All moved slowly and lazily, presenting a very different appearance from the busy little workers one sees running rapidly hither and thither in the proximity of the nest. I was mys-

Most of the little houses—for houses they seemed to be—were sticking to the panels of the fence. Some were built over the shoots themselves on which the aphides were feeding, affording cover to aphides as well as ants. The appearance was that of a village in miniature. Some, however, were built upon free shoots, waving to and fro in the wind-breezy homes for the small dairymen. Some of the ants, I soon discovered, were engaged in tearing up wood fiber, of which the houses were made, and sticking the pieces together, to build new ones or repair old ones. During a shower or on a rainy day the houses were always quite full; but, when the sun dispelled the clouds and once more shone again, the little builders sallied forth to repair the damage done their frail houses by the passing rain or squall, or to milk the aphides in their pastures on the shoots.

The ants use these structures exclusively as shelters. and my continued observations failed to detect any other use or purpose in their construction. They were kept in constant repair and were used at night and in rainy weather; and even in the daytime served as retreats for those not occupied at the dairies. One broken open during the day seldom failed to reveal several of the inhabitants at home. As the shoots of the creeper grew with the advancing season, and the aphides were transferred gradually further from the shelters, the ants abandoned them and built themselves new ones, nearer the dairies. Those abandoned soon fell to pieces, being washed away by the showers.

The true nest and home of all the ants on the creeper was in a pile of boards, at some distance from the fence-probably some ten or fifteen feet away. I have seen shelters like these since, and on this fence; but never in such numbers as they appeared that season. I have seen them built by ants of this same species. while tending aphides on the tendrils of the grapevine and on the young shoots of the wild raspberry.

No mention of the foregoing facts has ever come to my notice. If ithey are on record as observed. I of Bessemer steel in all its forms; and, as recently should like to be further informed with regard to this

#### Correspondence.

#### A Needed Patent Office Reform.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of October 23, your correspondent, Mr. William G. Heath, in an article entitled, "A Needed Patent Office Reform," has by implication unintentionally done some injustice to the authorities of the 31, 1891, p. 1; December 31, 1892, p. 1; June 30, 1893, p. 6; Patent Office, and evidently is not fully advised of the many and burdensome limitations by which that office is hampered. Nor is it probable, indeed, that the true state of affairs is generally known to the public.

Mr. Heath, after referring to the fact that four months' delay before office action is taken after filing is not an uncommon thing, remarks that with a surplus of \$300,000 accumulated during the past year, and a total surplus to the credit of the office of more than \$5,000,000, it would seem that there is no excuse for submitting inventors to such long delays . . . on the ground that the office is overworked, or the force of examiners insufficient, and he very pertinently asks, "Why is that \$5,000,000 surplus lying idle when it might be expended in supporting an increased force of examiners, and thus facilitating the work of examination?"

The answer, however, is very simple. The Commissioner of Patents has no power and authority whatever over a single penny of the receipts of the Patent Office. Every cent must, by law, be covered into the treasury of the United States, and the only funds available for the expenses of the office are such as Congress annually appropriates for that purpose, specifying how much must be spent for each branch of the service, and even enumerating the entire office force to a man, prescribing their duties and salaries, and specifying the various amounts to be expended for supplies and 31, 1890, p. 6; Dec. 31, 1891, p. 10; June 30, 1893, p. 5.) other expenditures.

Year after year the number of applications filed for patents has increased, and the field of research which the examining corps must daily traverse has broadened out, its extent being no less than the entire issue of domestic and foreign patents, as well as all technical and that if the work is not to fall hopelessly in arrears, an scientific literature, in all languages, which forms a mass of printed matter that is growing at a very rapid fiscal year. Such increase will be included in the estirate.

Thus in 1886 the office received 35,968 applications in 1896, 43,982. Up to 1870 the number of foreign patents issued by all countries other than the United States was approximately 358,000, while between 1870 and 1896 1,282,000 were issued; and technical and scienno material increase has been made in the office force simply because Congress has not given the Commissioners power to make it.

Year after year successive Commissioners have in their annual reports called the attention of Congress to here at length. these matters, and in the strongest language at their command . have suggested, recommended and almost implored Congress to afford the necessary relief, but thus far all to no purpose.

I could fill many pages of your journal with their utterances upon this head, were they available. I will merely point out where those interested may read what things have been repeatedly recommended and asked for in vain since the year 1890.

The recommendations for an increase of force divide naturally into two classes:

First, recommendations for an increase of the regu lar office force.

(See Reports Commissioner of Patents for June 3, 1890, p. 5; Dec. 31, 1890, p. 5; Dec. 31, 1891, p. 4; Dec. 31, 1892, p. 5; June 30, 1893, p. 4; Dec. 31, 1896, p. 6; in which latter Report the increase asked for was 10 primary examiners, 50 assistant examiners, 10 clerks, 10 copyists, 10 messengers, and 10 laborers.)

Second, recommendations as to the establishment of the "Classification Division," designed to perfect the present classification of the great mass of existing patents and literature and establish a system of cross references which will facilitate and shorten the official actions of the examining corps.

30, 1894, p. 6; Dec. 31, 1894, pp. 5 and 6; Dec. 31, 1895, For, as is well known, the office is full of so-called pp. 20 and 21; Dec. 31, 1896, p. 33; in which latter instance an annual appropriation of \$64,500 was asked for, covering 52 additional employes.)

It is a notorious fact that in every department of the Patent Office the employes are overcrowded to an extent inimical to health and detrimental to the good of the service, to the great inconvenience of the public having business to transact there.

The Patent Office building, built by the money of inventors, from their fees, and ostensibly for their sole use, contains also the General Land Office as well as other offices of the Interior Department.

The models have been gradually crowded out of the building, until now the once famous model room is practically a thing of the past.

In 1895 the then Commissioner thus addressed Congress (Report, December 31, 1895, p. 16): "The force of pended in bettering the service, notoriously insufficient of a reddish color, may be used in building, and perthe Patent Office is scattered in remote parts of the in certain lines; for to make the Patent Office a source haps even for cabinet making.

building, its valuable records are disposed upon all the floors, and are at all times exposed to the danger of conflagrations and other loss. There is an apprehension that the galleries are overloaded beyond the safety limit, and the sanitary conditions in many of the rooms are a constant menace to health."

Other utterances will be found as follows: Reports, June 30, 1890, p. 6; December 31, 1890, p. 4; December and December 31, 1896, p. 34.

The Commissioners have repeatedly called the attention of Congress to the growing needs of the Scientific Library.

(See Reports for Dec. 31, 1890, p. 8; June 30, 1893, p. 5; Dec. 31, 1893, pp. 6 and 18 to 22; June 30, 1894, p. 6 Dec. 31, 1895, p. 11.)

One of the real needs of the office is a suitably equipped laboratory for chemical, physical, metallurgical and other technical and mechanical tests, and experiments in pending cases where the operativeness of mechanisms or processes, or similar questions, are involved, and can only be settled by practical tests. Such a laboratory should be liberally supplied with apparatus and material, and be in charge of skilled attendants whose entire time should be given to this class of work. Upon this subject see recommendations in the Reports of Dec. 31, 1890, p. 6, and Dec. 31, 1891,

The attention of Congress has also often been called to the need of the Patent Office for a suitable hall in which to display its very valuable and interesting collection of models.

(See Reports for Dec. 31, 1890, p. 7; Dec. 31, 1893, p. 11; and Dec. 31, 1895, p. 17.)

General increases in salaries have been recommended as follows. (See Reports of June 30, 1890, p. 6; Dec. In the Report of the present Commissioner of Pat ents for the year ending June 30, 1897 (Official Gazette, vol. 80, page 1613), the following language will be found: "I desire to call especial attention to the steady increase in the business of this office, and to say increase of force must be provided during the ensuing mates which I shall submit in a few days. I also lay particular emphasis upon the imperative necessity that means be provided for the improvement of our facilities for transacting the vast amount of business, which is daily expanding in every branch and division of the office." The Commissioner then recommends tific literature is increasing in geometrical ratio, while that Congress provide a contingent fund of \$40,000 per annum to be disbursed "under the direct supervision of the Commissioner of Patents." The matter is then amplified and the pressing needs of the office set forth in very forcible terms which cannot be quoted

In conclusion, then, what is one of the most needed Patent Office reforms? Evidently a more generous appropriation by Congress of the sinews of war. Why should \$300,000 per annum be collected from our inventors over and above the actual expense of running the Patent Office, and then the appropriations for annual expenses be so cut down by Congress as to mate rially impair the service and subject the inventors, whose fees support the bureau, to long and needless delays, working untold injury to great manufacturing interests? Why are not our inventors justly entitled to as thorough and complete a preliminary examination, and as valid a patent when issued, as money, skill, and experience can afford, and which they would long since have had if the off-repeated recommendations of practically every Commissioner who has held office for the last twenty years had received proper attention from Congress? Why should so large a portion of the building erected by the money of inventors, for the transaction of their business, be occupied by other non-supporting bureaus to the detriment of the service? Why should their models be crowded out of the building where they most naturally belong? Why should not the bureau be provided with a laboratory and scientific and law library, each fully equipped and in every way suited to (See Reports, Dec. 31, 1891, p. 4; Dec. 31, 1892, pp. 6 to its pressing needs? Why should not salaries be in-8; June 30, 1893, p. 4; Dec. 31, 1893, pp. 5 and 6; June creased to be commensurate with services rendered? laborers at laborers' pay doing the work of stenographers and skilled clerks, of messengers at messengers' pay doing the work of assistant examiners. Were it not for such expedients as these, the office could not keep its head above water even as well as it does at the present time, but the result of all this has been, and is, to turn the Patent Office into a mere training school for clerks for other departments of government (where pay is more proportional to services rendered) and for graduates into the patent bar of the country.

> An act of simple handed justice would be to turn over the Patent Office building to the sole use of the bureau serving the inventors whose money has built it; to allow the \$5,000,000 already collected from them by the only self-supporting bureau of our government to be ex-

of revenue is simply class taxation of an especially odious kind, because burdening with a special tax the class of citizens that have contributed so largely to the industrial and other development of our country.

But wherein does the remedy lie? Evidently in the halls of Congress. I think, judging from the pastthere will be no relief, or at least relief that is at all adequate, until the inventors and manufacturers of the country, one and all, take a personal interest in the matter, and use their personal influence with their Senators and Representatives in Congress to see to it that in this matter simple justice is done them. Now is emphatically the accepted time. Congress will soon meet, and the entire subject will once more be brought before that body by the present Commissioner of Patents, and pressed with all the vigor of which he is capable.

With the immediate and hearty co-operation of the real parties in interest—the inventing and manufacturing public-along the lines above suggested, very much can be accomplished for the lasting good of the country in general and its industrial interests in particular. E. A. H.

Washington, October 28, 1897.

#### Death of Thomas Doane.

Thomas Doane, of Charlestown, Mass., the well known civil engineer, died October 22. He was born at Orleans, Cape Cod, in 1821, and after attending the Andover Academy he entered the office of Samuel L. Felton, a noted engineer. After remaining with him for three years he became engineer of a division of the Vermont Central Railroad. Mr. Doane was connected at one time and another with all the railroads running out of Boston. In 1863, he was appointed chief engineer of the Hoosac tunnel. He located the line of the tunnel and built the dam in the Deerfield River to furnish water power. In this work he introduced nitroglycerine and electric blasting for the first time in this country. In February, 1875, he ran the first locomotive through the tunnel. In 1869 he went to Nebraska and built 240 miles of railroad on the extension of the C., B. & Q. R.R. He made the question of grades a special study, and so perfect were those on the extension that one engine could haul as many cars to the Missouri River as five engines could haul across Iowa. When in Nebraska he took a leading part in the agitation of the question of establishing a college in that State, and in recognition of his services the institution was named Doane College.

#### History of Ivory.

The earliest recorded history—we might say prehistoric, the hieroglyphical—that has come down to us has been in carvings on ivory and bone. Long before metallurgy was known among the prehistoric races, carvings on reindeer horn and manimoth tusk evidence the antiquity of the art. Fragments of horn and ivory, engraved with excellent pictures of animals, have been found in caves and beds of rivers and lakes. There are specimens in the British Museum, also in the Louvre, of the Egyptian skill in ivory carving, attributed to the age of Moses. In the latter collection are chairs or seats of the sixteenth century B. C. inlaid with ivory, and other pieces of the eleventh century B. C. We have already referred to the Nineveh ivories. Carving of the "precious substance" was extensively carried on at Constantinople during the middle ages. Combs, caskets, horns, boxes, etc., of carved ivory and bone, often set in precious stones, of the old Roman and Anglo-Saxon periods, are frequently found in tombs. Crucifixes and images of the Virgin and saints made in that age are often graceful and beautiful. The Chinese and Japanese are rival artists now in their peculiar minutiæ and detail.-N. B. Nelson, in Appleton's Popular Science Monthly.

#### A New Tallow Tree.

The Myristica surinamensis Roland, of Guiana, and the Myristica kombo H. Bn., of Congo, furnish a grease resembling tallow in consistency, to which fact they owe their name of tallow trees. The tree which we wish to introduce to our readers, says the Revue Coloniale, does not belong to the same species nor to the same family. The tallow tree of West Africa may, indeed, be classed among the family of the guttifers, and had at first received the generic name of Stearodendron, for which subsequently that of Allanblackia was substituted.

The Allanblackia Stuhlmannii Engler, known in Usambara by the native name of msambro, is a large tree with pretty, large, fleshy flowers of a singular shape which at once attract the attention of the traveler. The fruits, which attain the size of a human head, contain a large number of seeds which are extraordinarily rich in fatty substance. According to Holst, the seeds of only four fruits furnish one kilo to one and a half kilos of grease of the spissitude of tallow. This may be used in the manufacture of candles. Quite an important trade is done in it already in Bagomoyo. The wood,

#### A TROLLEY WAGON FOR COUNTRY ROADS.

The subject of traction on common roads early received the attention of engineers, and many experiments have been tried to solve this interesting and important problem. The steam traction engine has been

used to a limited degree, but it does not appear to have been so successful as it might be. Light automobile carriages have been used to some extent, and it is probable that in the future they will attain a considerable usefulness. The electric carriage offers advantages for use on common roads, but it is doubtful if they will prove very successful, owing to the great weight of the storage batteries, except on the most perfect roads that have small grades. The subject of the transportation of farm produce has engaged the attention of economists and even of the government. It is easy to cite statistics which show that the farmers in country districts lose vast sums annually owing to the difficulty of transporting their produce to the railroad by which it can be shipped to the consumer or exported. In England the light railway has been tried with some success, but the expense is against its more general use.

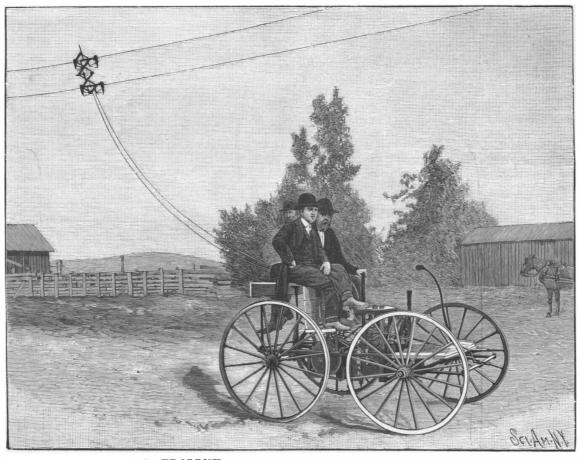
We illustrate a system which is certainly remark-

power is available should be very successful. The trolley electrical road wagon shown in our engravings is the invention of Mr. W. G. Caffrey, of Reno, Nevada, who has associated with him Col. H. B. Maxson. The cost of installing the overhead trolley system is not prohibitive, and where a cheap source of power is obtainable the expense of working and maintenance would not be great. Mr. Caffrey has been at work upon this system for three years, and the wagon which we illustrate has been tested successfully. A line of ordinary poles was therein. The two wires were secured to the poles about 18 inches, fastened rigidly to the spindle. These tax we do not know. Possibly it is not greatly injured,

eighteen inches apart and seventeen feet from the ground and a trolley with a lazy tongs arrangement allowed the current to be furnished to the wagon. The problem which the inventor had to solve was a difficult one, as a perfect circuit must be maintained at all times and the contact must be flexible enough to allow a wide divergence from the regular road if necessary.

The improved form of trolley works admirably. It consists of a metallic frame having two overrunning wheels, and underneath these are the two locking wheels, which effectually prevent the top wheels from leaving the wire and still allow the frame to pass the support, holding the wire on the pole. On the lower wire a similar device is used. The two trolleys are connected by an insulated pantograph or lazy tongs equipped with suitable guides, thus providing for unequal tension on the trolley wires. The poles are 24 feet long and 6 inches in diameter at the small end. They are placed at intervals of 125 feet. On the inner or road side of these poles are two supports or "pass-bys" of malleable iron. No. 0 bimetallic wires are used. The current is supplied to the wagons by cable which

runs on an automatic reel on the wagon, permitting two arms are connected, and the connecting bar ordinary road and permitting it to turn or do anything generator used was a five horse power compound wound



A TROLLEY WAGON FOR COUNTRY ROADS.

able for its novelty and which in districts where water used, but the cable permits of running the wagon on either side of the ordinary road, allowing it to meet or pass vehicles without difficulty.

The four-wheeled wagon shown in our engraving has wheels 48 inches in diameter. The rear wheels are fastened to a shaft geared to a spring-suspended motor. The motor is a two horse power one of the Westinghouse crane type. In front of the motor a commutator controller is suspended, the handle of which is within easy reach of the person steering the wagon. The front axle is trussed and the spindles are pivoted set up near the Reno foundry and the dynamo placed to the wheel hub, with an arm extending forward it from the blood. Whether the skin is harmed by this

the cable to run out 200 feet if necessary, or wind up to again connected to the steering bar. This gives a short length, thus allowing the wagon to follow the quick turning qualities with easy manipulation. The required of it. The ordinary trolley pole may also be Westinghouse 500 volt dynamo. It is said that on the

trial trip a speed of fifteen miles an hour was reached with a load of 2,500 pounds on the wheels. The control of both the motor and the steering apparatus was all that was desired. The trolley moved easily over the wires and there was no difficulty with the "pass bys."

The development of the long distance power transmission and the utilization of this or some similar system will prove of great value to the farmer and those who have occasion to transport goods along country roads.

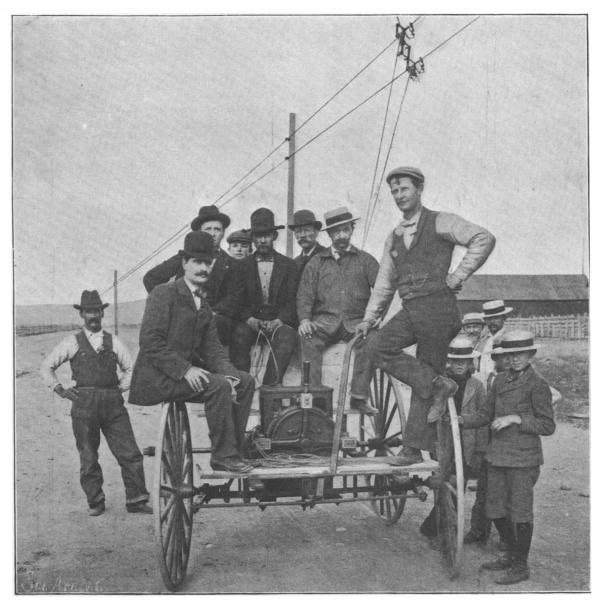
#### The Salt Habit,

The use of salt as a condiment is so general and so universally believed in as necessary that we rarely hear a word against its excessive use, but there are a multitude of persons who eat far too much salt; eat it on everything-on meat, fish, potatoes, melons, in butter, on tomatoes, turnips and squashes, in bread and on a host of foods too numerous to mention. To so great an extent is it used that no food is relished

which has not a salty taste, and this hides more or less the real taste, which is often very delicate. Now, the amount of salt required in the system is comparatively small, and if the diet has been rightly compounded, very little is necessary. Some go so far as to discard its use altogether, but whether this is wise or not we will not here consider. What are some of the evils of the excessive use of salt? They are to paralyze the nerves of taste, or to pervert them so that they cannot enjoy anything which has not a salty flavor, and in addition there is a direct tax on both the skin and the kidneys in removing

> yet we know that few people possess a healthy skin; but it is now pretty well settled that an excessive use of salt does overtax the kidnevs in its removal and that the great number of cases of derangement and disease of these organs is due to this use. It takes only a little time to learn to enjoy many kinds of food without salt, and we advise our readers and others to look into this matter and to try and diminish the use of this condiment as far as possible. We believe they will be better for it.—Journal of Hygiene.

AT Crevalcore, a small town situated on the outskirts of Bologna, there was unveiled on September 8 a bronze monument erected in honor of Marcello Malpighi, the celebrated Italian anatomist, botanist and microscopist, the contemporary, among others, of Hooke, Grew and Oldenburg, names famous in the early annals of the Royal Society. Malpighi's relations, indeed, with that society were close and cordial throughout. His interesting correspondence with Henry Oldenburg, its first secretary, and with men equally concerned in the "Improvement of Natural Knowledge," is carefully preserved in the society's archives,



FRONT VIEW OF TROLLEY WAGON.

#### ARRIVAL OF DR. NANSEN.

Dr. Fridtjof Nansen, the Norwegian explorer, arrived in New York October 23, on the Lucania, and was met at Quarantine by the steamer Favorite, with the Nansen committee, composed of Scandinavians who live in New York, and members of the press. The distinguished explorer left the Lucania and came up to the city in the Favorite. Mr. Carl G. M. Woxen, consul the northern boundary of Greenland, though his so many great explorers." He concluded by professing

tioned as to whether Andrée was lost. The doctor said he did not think Andrée was lost, it being too early said he had none bearing on Arctic exploration. He said he had no idea of leading another expedition in search of the North Pole.

troduced by Ex-Judge Daly, who then presented to him the Cullum Geographical Medal, which bore the to assume this, as yet. As to his own plans, Dr. Nansen | inscription, "Awarded to Fridtjof Nansen for his voyage in the Fram and sledge journey on the ice floes to 86° 14' north, 1893-1896." After Judge Daly's presentation speech, Dr. Nansen said he specially appreciated He said he did not expect to undertake the fixing of it, "because it is given me by a nation which has had



DR. NANSEN'S TRIP TO AMERICA.

for Norway and Sweden, made a speech in Norwegian | former captain, Sverdrup, was about to head an ex-|his admiration for Lieut. Peary, and hoped he would welcoming the explorer to America, to which Dr. Nansen responded in the same tongue. Prof. Libbey, of Princeton, delivered a brief welcoming address and Dr. Nansen replied in English, which he spoke with apparent ease. A choral society sang Norwegian patriotic songs. The visitor was escorted to the Hotel Savoy, where he will stop during his visit to New York.

It is natural that Dr. Nansen should have been ques-

pedition for that purpose.

There was an enthusiastic reception for Dr. Nansen in the evening at Chickering Hall, given by the American Geographical Society. The hall was filled with people who rose to their feet and applauded the explorer as he came upon the platform. Lieut. Peary was present, as were also Sergt. Long, of the Greely expedition, and Capt. Brainerd. Dr. Nansen was in-thought that it was most fitting that the Norwegians,

reach the pole on his next expedition. Lieut. Peary and Capt. Brainerd also made brief addresses. Capt. Brainerd said: "The United States held the record for the furthest north for fourteen years. When I learned of Nansen carrying the Norwegian flag beyond the point reached by the stars and stripes it was something of a shock to me, but I was consoled by the the descendants of the old Vikings, should hold the

On October 26 Dr. Nansen was a guest at a reception given at the Arlington Hotel, Washington, by the National Geographical Society. A large number of scientific men were present, including Gen. Greely and Commodore Melville. President McKinley received Dr. Nansen in the Blue Room of the White House on the same day. Our engraving represents Dr. Nansen as he appeared in London during his lecturing tour last

#### Mercier's Process for Eliminating Hyposulphites.

Photographic negatives or prints, says M. Mercier, are usually subjected to a final treatment by a solution of hyposulphite of soda in order to dissolve the argentic salts, which treatment is termed the fixing, after which they are washed for some time in order to eliminate the hyposulphites. Such washing often consumes a considerable time, especially when the treatment with hyposulphite of soda has been incomplete, as the negatives and prints retain in such cases an argentic hyposulphite which is insoluble in water and withstands the action of ordinary washings.

My invention relates to means for avoiding these long and tedious washings by the use of solutions prepared with the aid of iodine or iodides, bromine or bromides, in the following manner, that is to say:

- 1. I may dissolve in water alkaline iodide such as iodide of potassium or iodide of sodium. I have discovered that alkaline iodides decompose argentic hyposulphites contained in the negatives or prints as they are withdrawn from the fixing bath, while thus to a far higher degree than alkaline chlorides, such as common salt, which had been heretofore recommended as a dialytic eliminator of hyposulphites.
- 2. Instead of using alkaline iodides alone, I may use conjointly with them salts having an alkaline reaction, such as carbonate of soda, sulphite of soda, sodic phosphates and the like, or an alkali such as potash soda or ammonia. I have discovered that the elimination of the hyposulphites is thus more rapid than with the iodides alone. I often add to the above compounds a small quantity of common salt, which, however, is not indispensable. As a practical illustration of the above indications, I may use a solution containing about four grammes of iodide of potassium in one liter of water, or I may use the following:

Iodide of potassium	4 gra	mmes.
Carbonate of soda	. 1	"
Common salt	. <b>3</b> 0	66
Water	. 1 lite	r.

I may substitute for the above alkaline iodides alkaline bromides, but in such cases the elimination of the hyposulphites proceeds more slowly.

Instead of using alkaline iodides or bromides in the solutions above named, I may prepare them directly with bromide or iodine, which method was the first employed by me, the former process having been discovered subsequently after further experiments.

To prepare the latter solutions, I dissolve iodine or bromine in a suitable quantity of water with an alkaline salt, and by perference carbonate of soda. I may use by way of example the following formula:

Powdered iodine	. 3 grammes.
Carbonate of soda	. 30 "
Water	. 1 liter.

To facilitate the solution of the three grammes of iodine, I dissolve them previously in forty grains of alcohol or thereabout.

I thus obtain a yellow solution which cannot be used forthwith, for it would corrode the photographic image; it is therefore necessary to wait until it becomes spontaneously discolored, which requires from one to two days or longer, or it may be discolored by heating it for a few minutes, or by adding thereto a small quantity of ammonia; when the solution is discolored and cool, it can be utilized forthwith.

Colorless solutions of the kind above described may be obtained by adding a small quantity of sulphite of soda or by using the latter alone in lieu of the car- en route. At the instigation of the Prussian War a vertical copper wire, ten millimeters in section, well bonate of soda, but it is preferable to use the carbon-Office, investigations have recently been made by ate alone, in order to prevent the introduction of means of a special apparatus into the question whether sulphurous compounds in the eliminating means.

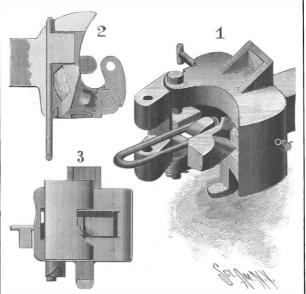
To use my solutions, the photographic negatives or prints impregnated with the hyposulphite of the fixing bath are slightly washed with water to remove the largest portion of its hyposulphites; they are then immersed in one of my solutions for a short time, varying from five minutes to one or two hours, according to requirements. The negatives or prints may be passed through several similar baths if required, the operation being completed by washing them for a few minutes in clean water.

The efficacy of my process can be readily demonstrated, particularly as regards negatives or prints which have not been left long enough in the fixing bath and are still impregnated with argentic hyposulphite, which is insoluble in water, and it is easy to ascertain had previously been gone through, and hence the adwhen the negative or print contains no more hyposulphite by lightly touching a point of the white parts of sugar had the effect of producing an increased capabilthe prints with a brush previously dipped in a ten per ity for work.—English Mechanic.

cent solution or thereabout of nitrate of silver, when if there be any hyposulphite left, there is formed a yellow spot at the said point.—The British Journal of Photography.

#### AN IMPROVED CAR COUPLING.

The accompanying illustration represents a car coupling possessing some novel features designed to afford increased efficiency in railway service, the coupling setting itself automatically ready for coupling when locked up to disconnect it from another coupling, and it being impossible for it to become uncoupled of itself, as it requires two movements to uncouple it. The invention forms the subject of a patent issued to Thomas H. Smith, of Bowie, Texas, and improvements for which application is pending. Fig. 2 is a partly sectional plan view of the coupling and Fig. 3 a front end elevation, Fig. 1 representing a coupling of this type adapted for coupling with cars provided with the old style of link and pin coupling. The drawhead is recessed from the front and has ears at one side, the tailpiece of a pivoted knuckle block swinging into the recess, and there being on the lower ear a depending lug having an incline forward of the knuckle pivot. The knuckle block also has a depending incline on the lower side of the coupling limb, adapted to traverse the incline on the drawhead and cause the knuckle block to swing open by its gravity. A transverse tripping shaft extends through an aperture in the side wall of the drawhead recess, a gravity block projecting forwardly from the tripping arm being adapted to lock the knuckle block when closed and to release it when the tripping shaft is lifted, a limb on facilitating the washing of the negatives and prints the tailpiece being concaved on the top edge to receive the tripping shaft when the latter is raised and moved forward. The device couples closely to link and pin coupling or to the "Miller" coupling, the



SMITH'S CAR COUPLING.

link being placed vertically behind and brought down over a boss, making a close and safe coupling. It will not override or permit the coupling to fall to the track when torn from the draught timbers. The knuckle is opened ready for coupling by movement of lever, and it will couple with all vertical planes automatically. The device consists of but three parts, which may be cast into form and used as shaped in the mould, the facility of manufacturing rendering the coupling inexpensive and well adapted for general use.

#### Sugar and Muscular Exertion.

It is a fact well known to Alpine tourists that on difficult climbing excursions an increased desire is felt for the consumption of sweets and sweetened foods, and many who never touch such things at home devour large quantities of them on these tours. It is also frequently remarked how eagerly the guides appropriate any sugar that may be left over and consume it the consumption of small quantities of sugar rendered the tired muscles capable of renewed exertion. In order to obtain a practical result, the person who was made the subject of the experiment was kept totally ignorant of the object of the experimenters. On one day a sweet liquid was administered containing thirty grammes of sugar, on the next day a similar liquid containing a sufficient amount of saccharin to render it indistinguishable from the other as regarded taste. When a very large amount of muscular work had been performed, it was found that a greater quantity of work could be got through on the days when the sugar was given than on the days when saccharin was given. The system had become very poor in sugar, in consequence of the severe muscular effort which ministration of a comparatively small quantity of

#### Science Notes.

Prof. Otis T. Mason, the ethnologist of the United States National Museum, has been honored with LL.D. by the Columbian University.

In January last, at Hanover, after a period of cold weather, there fell on the rising temperature a snow in the form of compact balls, says Science. Many of these balls were simple and completely transparent, and consisted of single, simple, spherical crystals. These are described by F. Rinne in the Jahrbuch für Mineralogie. Apparently they were crystallized rain drops, but all efforts to make them artificially were without result. They resembled the chondrites of many meteorites, and these also Dr. Rinne finds it impossible to form artificially.

It is universally admitted that one of the most important outdoor occupations in its relation to public safety and to eyesight is that of the railway service. In England the same importance in securing accuracy in this field by scientific tests is given to those employed in the mercantile marine service. In a recent parliamentary report on tests for color ignorance and form vision it was stated that in 1896 5,051 persons were examined in form vision and thirty-four failed, 5.017 were examined in color vision and fifty-one failed. Of officers already in possession of certificates, who were examined in 1896, twelve failed to pass sight tests, one master, five mates, and two second mates failed in color vision and one mate and three second mates failed in form vision.

Gen. W. W. Duffield has resigned as superintendent of the Coast and Geodetic Survey and will be succeeded by Henry S. Pritchett, Professor of Physics and Astronomy in Washington University, St. Louis, Mo. Prof. Pritchett's support came almost exclusively from his scientific colleagues, and the application on his behalf was filed in the Treasury Department without his knowledge. He was five years in the Naval Observatory and for fifteen years has been connected with the Washington University. He is only forty years old and is the youngest man ever appointed to the head of the survey. He has been connected with the work of the Coast Survey and spent a year in Japan and China conducting experiments for determining the figure of the earth. Prof. Pritchett speaks French and German and has received a number of scientific degrees from American institutions and holds the degree of doctor of philosophy from the University of Munich.

Madder root, when freshly dug up, contains about eighty per cent of moisture, but after drying for sale this is reduced to about fifteen or twenty per cent. All samples contain a large proportion of extractive substances, consisting mainly of sugary and gummy matters, starch, pectic acid, etc. As a means of generating fermentation in the indigo vat, the value of the madder is almost entirely due to these extractive matters. In madder, says Mr. W. H. Gardner, in The Textile Recorder, the coloring principle is a glucoside, rubian, which has the composition C28H32O16. It was first isolated by Schunck, who prepared it thus: Fresh madder root is extracted with boiling distilled water and the filtered solution treated with animal charcoal, which absorbs the rubian and chlorogenin. The charcoal is then collected on a filter, and washed with cold water to dissolve the chlorogenin, after which the rubian is dissolved by treating the charcoal with successive portions of alcohol, obtained by evaporation of the solvent. When thus prepared it forms a dry, brittle, amorphous mass of a gummy nature. It is soluble in hot water or alcohol, but insoluble in ether, and is not precipitated from solution by metallic salts.

It is interesting to learn that a descriptive account of Sig. Marconi's "telegrafo senza fili" has been published in an official paper issued by the Italian government. The author is Prof. Angelo Banti. In the experiments at Spezia it appears that good telegrams and clear signals were got through at a distance of twelve miles. The means adopted were, it is stated, the securing to the mast of the ship, ninety feet high, covered with guttapercha. One end was attached to the receiver on board, the other end was free. Another mast of like height was erected ashore, and the transmitter was attached to its vertical wire. Another mast and transmitter were also placed in the arsenal. The ships employed were two ironclad war vessels, and these were engaged for a fortnight in taking observations. In these experiments it was demonstrated that the instruments could be securely placed deep down in the hull, messages being perfectly intelligible by the receiving instrument in a cabin eight feet under water, notwithstanding its surroundings of massive iron. The vertical wire has been shown to have greater efficiency than the horizontal wire. We also learn that the invention is essentially a practical one, and the visionary notions of blowing up powder magazines and synchronizing watches are wild dreams. Many suggestions, too, of previous efforts in wireless telegraphy have been current, but from all these Sig. Marconi's invention is distinctly separated.

#### THE CASTING OF ART BRONZE.

appearing at the dawn of humanity and following applied to a clay core and fastened 'together, gave, for civilization step by step in all the phases of its develop- a large number of specimens, the wax image to be rement. It is upon it that man, scarcely having got be produced in bronze. But this discovery, which was he, by the ordinary processes of moulding in wax, covyond the stone age, made his first experiments in doubtless very interesting, was nevertheless inadequate ers the statue to be reproduced with slip, melts the

have come down to us make known to us quite accurately the processes in use at these remote epochs.

During this long succession of ages, the only process of any importance discovered was that of casting statues in a single piece, and which dates back to the end of the seventh century before our era. The methods that we now employ are almost exactly those used by our ancestors, the inhabitants of the lacustrine cities.

The manufacture of art bronze is divided into two parts-moulding and casting.

Moulding is the more delicate part of the operation, and upon it depends principally the success and proper execution of the piece. We are acquainted with three kinds-moulding in clay, especially employed for large bells, moulding in dry sand, the most usual process, and finally, moulding in wax, the most perfect but most costly process.

Now, these three processes were already in use in pre-

in making excavations.

The principal drawback to moulding in sand is that in a statue the floating drapery, hair, arms and legs form as it were so many corners in the sand that interthe object of art into sections, to mould the different bronze mounters. But the intervention of these differ-

color that can be got rid of only by the aid of a bronzing of varying thickness with glaring reflections which completely modify the value of the half tints reserved by the artist. Moreover, the chaser, often too zealous, emphasizes with his graver certain parts that the statuary had purposely left somewhat vague for the sake of concentrating attention upon the principal points of his work.

It is for this reason that wax, despite its high price, is infinitely preferable, it permitting of obtaining a casting in a single piece almost without joints.

At the epoch of the Renaissance, as in antiquity, the artist did not consider it beneath him to do the material part of the work himself. He gave the general outline by means of a clay core provided with strong bracings. This core was covered with quite a thick layer of wax in which the artist modeled the details. This wax was afterward covered with numerous coats of slip, at first very dilute and then thicker and thicker, so as to inclose the wax in a sort of gangue, both fine grained and resistant.

This done, a moderate heat sufficed to melt the wax, which, upon flowing away, left empty the space that the bronze was to occupy. After removal from the mould, one had in bronze a faithful reproduction of the work that the artist had modeled in wax.

Unfortunately, it too often happened that for various causes the bronze did not completely fill the space reserved for it, and the statue was then lost or at least much damaged. In admitting, even, complete success, there could be but one specimen of the work, without the possibility of obtaining an absolutely identical reproduction of it.

The needs of modern industry could not accommodate themselves to long and costly processes such as this, and it became necessary at any cost to substitute the workman for the artist in order to expedite matters and do the work more cheaply, although not so well. So the

idea occurred to employ partial moulds for the pro-Bronze is the oldest known of all metals. We see it duction of small sheets of wax, which, afterward metallurgy, and the numerous objects of bronze that to give absolutely satisfactory results. It was left to wax and casts the metal.





Fig. 1.-MOULDING OF A WAX STATUETTE BY THE LE BOURG PROCESS.

Fig. 2.—HALF MOULD, SHOWING THE DIFFERENT ELEMENTS.

A. Plaster Shell. B. Gelatine Mould. C. Layer of Wax. D. Clay Core.

order of ideas, a process that was infinitely superior. from the standpoint of the results obtained, as well as from that of saving in manual labor.

This process, briefly described, is as follows: The fere with the removal of the object from the mould. In fact is well known that gelatine, although hard and second half of the statue. If, at this moment, the shell most cases, therefore, it becomes necessary to divide dry when in contact with the air, softens and swells up in two pieces, lined internally with gelatine, be put when immersed in water, and becomes hard again upon parts separately and afterward to unite them. This losing its humidity. But if instead of water we employ | pression of the statue to be reproduced will remain in business is intrusted to the trimmers, chasers and glycerine and glucose, the elasticity will be preserved the middle of the mould. for a long time. By means of this soft gelatine, M. Le ent trades has the effect of injuring the artistic value of Bourg, instead of moulding the elements of a statue, properly dried and introduce it into the cavity in the the work, since scraping produces differences in the moulds the latter in its entirety, surrounding it with a middle of the mould. This it will occupy almost en-

A SINGLE RAIL MOUNTAIN RAILWAY.

gelatine envelope in two pieces which is detached with the greatest ease and gives moulds of extraordinary fineness. Consequently, instead of an assemblage of elements, he obtains wax in a single piece. This done,

> In order to manufacture the gelatine moulds, one begins by taking two moulds in plaster and working upon these so as thus to leave the original absolutely intact. One of the two moulds is scraped down superficially to a proper thickness so as to form a core that serves for obtaining a "core box" absolutely like those used in sand moulding. The second cast in plaster serves for making the mould. To this effect, one begins by covering it with a thick layer of clay, which entirely envelops it. Then there is cast over it a plaster shell, A, in two pieces. One of the halves of this having been taken off, the clay is carefully removed, so that half of the statue is thus exposed. It may be easily seen that if at this moment the half shell be put in place, there will remain between the latter and the statue an empty space, B. corresponding to that occupied by the clay just removed. This space is then filled by running in soft gelatine,

historic times, as we know from objects and tools found M. Le Bourg, a French statuary, to devise, in the same which, owing to its extreme elasticity, may, at the proper moment, be taken out without ruining the model. (Fig. 2.)

Proceeding with the second half of the shell as with the first, there is obtained agelatine impression of the together, it will be seen that an exact and hollow im-

Let us now take a core, D, made in advance and

tirely and leave merely an annular space, C, that corresponds to the thickness to be given the metal. It is into this space that the melted wax is run, after which all that is to be done is to carefully remove the half shells in plaster and then the gelatine coverings in order to expose a statue that will be identical with that which an artist would have been able to model. (Fig. 1.) As may be seen, the Le Bourg process differs from the wax one only in the method employed for obtaining the wax cast, but with the advantage that the old process permitted of making but one casting, while now it is easy to have a large number absolutely identical and as delicate as those obtained by the classical wax process.

It is to be remarked that of all the operations that we have just described, none requires professional skill. Therefore, no more moulders, chasers, or mounters; and it is precisely one of the original features of the process that a bronze statue may be made without the intervention of any of the trades hitherto employed. The result is, besides, that the casts obtained have the rare merit of being an exact reproduction of the work of the statuary, whose artistic feeling is faithfully respected at every point.

We are indebted to La Nature for the engravings and particulars.

#### A SINGLE RAIL MOUNTAIN RAILWAY.

A mountain railway built on quite a novel plan was tested last year on a small scale, and is to be shortly opened in a different locality for regular service. The principal feature of the new system is that the force of traction is directed vertically upward, and is derived from a balloon. A single rail is used for the only purpose of directing the course of the train and keeping the balloon with its load captive. To this end the rail is made T-shaped, and the car runs on it, gripping it from the sides and from below. The rail is anchored to the ground at distances of about 15 feet. In the

descent the propelling force is gravity, and the balloon acts as a check to prevent accelerated motion. A ballast of water, taken up at the top of the mountain, provides the additional downward force required. The truck carries the water receptacle, which can be opened by the aeronauts during the journey. The truck and receptacle together weigh about 660 pounds, and when there is no wind the receptacle carries about 1,100 pounds of water, making a total weight of 1,760 pounds. When it is windy the strain between the balloon and the truck is diminished by letting the water out of the receptacle, thus compensating for the difference in power. The difference in weight caused by passengers entering or leaving the car is regulated by the use of separate weights, a sufficient number of which will be kept at each station.

The tests made of this system were very favorable, and the inventors, Messrs. Volderauer and Brackebusch. are preparing to build a similar line to run up the Hochstauffen, near Bad Reichenhall, Bavaria. The inventors purpose making a balloon with a diameter of 65 feet 7 inches and a lifting power of 10,560 pounds. The balloon, car, net, rope, etc., weigh 4,620 pounds, and an allowance of 3,300 pounds is made for passengers and aeronauts, leaving a margin of 2,640 pounds.

There is a storage house where the balloon may be left in case of storm, and all possible measures are observed to insure the absolute safety of the passengers. The whole device seems very appropriate for the purpose it is to fulfill, and there seems no reason why the enterprise should not prove entirely successful.

We are indebted to the Illustrirte Zeitung for the cuts and description.

#### Mosquitoes.

Our readers, says Science Gossip, probably noticed the great prevalence of mosquitoes last summer, but familiar though they may be with the methods of its attack, few have any idea of the complicated apparatus with which this fly works its mischief. The beak of the mosquito is simply a tool box wherein the mosquito keeps six miniature surgical instruments in perfect working order. Two of these instruments are exact counterparts of the surgeon's lance. One is a spear with a double barbed head, the fourth is a needle of exquisite fineness, a saw and a pump going to make up the complement. The spear is the largest of the six tools, and is used for making the initial puncture; next the lances or knives are brought into play to cause the blood to flow more freely. In case this last operation fails of having the desired effect, the saw and the needle

are carefully and feelingly inserted in a lateral direction in the victim's flesh. The pump, the most delicate of all six of the instruments, is used in transferring the blood to the insect's stomach.

#### Diphenal-a New Developer.

To the current number of the Photographische Correspondenz Dr. Julius Precht, of Heidelberg, contributes a note on this subject, an abstract of which may be interesting to our readers.

Diphenal is diamido-oxydiphenol, and is prepared from the acid extract of oxyazobenzole, and has been patented as a photographic developer by Leopold Casella & Company, of Frankfort, by whom it is placed on the market in the form of an alkaline solution, the salt itself forming white, needlelike crystals,, the solution being a dark brown color, which on dilution with water forms a nearly colorless solution, which does not stain the films nor the fingers, unless the latter are kept in the same for a very long time. It is stated to have all the conveniences of rodinal, with the advantages of pyro and iron. It gives extremely clear shadows, works very cleanly and free from fog, and gives all the delicacy and gradation of pyro. It surpasses all other developers in the latitude of exposure it allows, and with very great over-exposure there is no trouble. What it is necessary to do is to develop till the high lights are dense enough, and the shadows keep beautifully clear, more so than with any other developer except glycin.

It is specially suitable for objects with great contrasts, as it does not block up the high lights, and amateurs who are by no means certain of their exposures will find it exceedingly useful, as it so rarely gives fog. It is not a very rapid developer, the half tones and shadows succeeding the high lights in a regular manner, and not coming up simultaneously like metol, amidol and rodinal.

The stock solution is, for ordinary work, diluted with 15 parts of water for normal and over-exposure, while for under-exposure it may be used with only 8 or 10 parts of water. The brown color of the solution is not a sign of oxidation, as the stock solution has been kept for five months unchanged, and the diluted solution also keeps well. By repeated use the negatives do not, as with hydroquinone, become harder. With normal exposure and concentration the image appears in about twenty seconds, and development exposed plates, and a strength of 1:8, development

When it is known that correct exposure has been given, the developer may be used 1:10, and the image appears very quickly and development will be quite complete in about three minutes.

It is necessary to well wash the plates after development, in order to free them from the developer. If some of the ordinary fixing bath is mixed with a small quantity of the developer, the solution turns brown by the absorption of oxygen and a liquid is obtained which dissolves silver, and therefore can be used as a reducer. The brown solution thus formed also stains the gelatine. Diamido-oxyphenol can also be used without alkali as a developer—a property which is common to other para-amidophenols.—British Journal of Photography.

#### Firing Dynamite by Electricity.

At the Verbelia, Colorado, tunnel the dynamo used is located in the gulch twenty-five feet from the mouth of the tunnel; wires are run into the tunnel connecting with the electric caps, which, when the current is turned on, explode the dynamite. This electric cap, in construction, resembles an incandescent lamp, inasmuch as it has two wires leading into it with a filament of platinum, but it differs from the incandescent lamp filament in action. The filament in the lamp is strong enough to carry the current which makes it incandescent, and therefore gives out a steady light; ibut the filament in the cap is not strong enough to carry the current, but burns off, causing an electric spark to ignite the fulminating powder in the bottom of the cap and explode, thus exploding the dynamite. The wire and filament in the cap are held in place by sulphur, which is poured in while it is hot, thus making the cap waterproof. The dynamo, which connects by wires with a round of holes in the tunnel, has a pull-up or push-down handle, which is connected to the armature by means of cog wheels, which causes it to revolve at a high rate of speed, thus generating a large quantity of current, which is held in the dynamo by means of a short circuit until the armature has gained its highest speed, when the short circuit is automatically broken, allowing the current to flow through the caps and causing them to explode.

This is a safe way of exploding dynamite, says The Mining and Scientific Press, because the miner must get out of his shaft or tunnel before the current can be turned on, and, consequently, there is no danger of is complete in from five to ten minutes. With under- any of the shots going off prematurely or of any of them hanging fire; and, to be doubly safe, the miner may be continued for half an hour without harm. can keep his dynamo locked and the key in his pocket.

#### RECENTLY PATENTED INVENTIONS. Railway Appliances.

CAR SIGNAL.—Caroline E. Miller, Minneapolis, Minn. This invention relates especially to signaling devices for street railway cars, and provides a manually adjustable device to indicate from a car the approach of another car on a parallel track, and be plainly visible to one about to cross the track, thus warning persons of possible danger from the approach of a carthat is concealed from view. The device consists of a series of foldable blades, each blade carrying an electric light, and circuit wires flexibly connecting all the lamps to a source of electricity, the blades also being painted so as to be conspicuous in daylight, and the arrangement being such that the blades may be conveniently thrown to open position or set to normal folded position.

SWITCH ACTUATING MECHANISM.—Albert D. Hill, Audubon and Tchoupitoulas Street, and John Pohlig, 3809 Tchoupitoulas Street, New Orleans, La. This invention provides for operating the switch tongues by an adjustable shifting lever carried by an car, the switch tongues being pivotally connected and levers extending therefrom carrying a tappet at their connecting point adapted to operate swinging dogs. The device is of simple construction, and is de signed to be readily operated when a train is going at full

#### Bicycles, Etc.

BICYCLE CRANK MECHANISM.—Henry I. Schanck, Holmdel, N. J. According to this invention a sprocket wheel is mounted eccentrically to the axle and has oppositely projecting parts, an arm being fixed to the axle adjacent to the sprocket wheel and having a hub running around the axle, while a second arm is held loosely to the axle alongside of the hub, projecting parts of the sprocket having sliding and pivotal connection with the arms. The improvement is designed to afford means for increasing leverage in applying power through the crank arms to the driving sprocket wheel during part of its revolution, giving proportionate increase of power for the propulsion of the bicycle.

BICYCLE DRIVING GEAR. - James E. Martin, Nicholson, North Dakota. The crank shaft, according to this invention, has toothed wheels with lugs on their side faces, the pedal levers having dogs engaging the teeth of the wheel, while gearing between the levers causes the movement of one crank in one direction and the other crank in the opposite direction, dogs pivoted to the levers engaging the lugs of the toothed wheels. and rollers on a guide frame releasing the dogs from the lugs. The gear is light and strong and may be applied to bicycles of the ordinary type without requiring material change in their construction.

#### Mechanical.

MITER BOX.—Thomas M. Griffith, West New Brighton, N. Y. For accurately guiding a saw in the formation of mating tongues and notches in the ends

nections may be readily made, this inventor provides a miter box of inverted U-shape in cross section, and having guide kerfs extending through the top and down into the sides of the box, the kerfs being similarly inclined in parallel planes and evenly spaced apart, there being also a longitudinally adjustable gage block on the under surface of the top at one end.

OIL CUP. - Wallace E. Tillinghast. East Greenwich, R. I. This invention provides an improved vent or auxiliary valve especially applicable for oil cups for use on crank pins and other rapidly moving parts of machinery, and designed to insure a steady flow of oil, without danger of forming a vacuum to retard the flow. On the upper head of the oil cup is an improved vent or air valve adapted to open automatically and positively in an inward direction, and the casing is formed with a flared or bell-shaped mouth, which acts as a funnel on the upstroke to concentrate the air at the opening in the valve seat, thus giving to the valve the positive properties of a pump.

#### Agricultural.

MACHINE FOR TOPPING SORGHUM.-Truman M. Paddock, Percival, Iowa. This is a device for attachment to a wagon bed, when, as the wagon is drawn between rows of sorghum, the tops of the sorghum will be directed over the wagon and cut off. A main guide arm is curved outwardly and forwardly away from the wagon body, and guides the sorghum between itself and a shorter spring arm at the rear of which is a knife, the attendant in the wagon holding the sorghum tops and drawing them with one hand against the knife, using the other hand to lay the tops straight in the wagon.

POULTRY COOP. - Charles W. Buinpass and William M. McCandlish, Bumpass, Va. For shipping chickens, turkeys, ducks, etc., these inventors have devised a novel form of coop of skeleton frameconstruction, covered with wire netting, the bottom being of basket work and readily removable. In connection with the removable bottom the base frame forms an important feature, as it furnishes a comparatively rigid support for the body of the coop, and facilitates taking out and putting in the bottom.

FRUIT GATHERING LADDER AND CHUTE.-George K. Davis, Lewiston, Me. This invention provides a wheeled ladder and attached chute which may be readily changed in position to gather fruit on all sides of a tree, the chute conveying the fruit down into a suitable receptacle. The props and tongues are detachable from the axle and standards of the wheeled vehicle, and the latter may be conveniently moved from place to place, the ladder bars being used as handles of a cart in pushing the device along. The chute is so made as to protect the fruit from being bruised in sliding down.

CHURN. - John Bennett, Lyndhurst, Canada. This churn has a reciprocal dasher serving to create a current of cream around a reservoir which may contain hot or cold water to regulate the temperature of the cream. The churn has within its body portion a hollow partition to be filled with a liquid of the desired

temperature, and by the operation of the dasher the of points, as in most carpet stretchers, and also affords cream is agitated against the dasher, the cream circulating through passages provided at the top and bottom of the partition and up and down its sides.

#### Miscellaneous.

EXTENSION LADDER.—Charles H. Waterman, Dayton, Washington. This ladder is mounted on a truck and operated by winding and adjusting devices also carried on the truck, the apparatus being normally kept in folded position. An endless flexible connection on the truck is attached to the ladder, the latter being pivotally connected by a link with the truck, the ladder also having a flexible connection for extending it, and there being two gearings for driving the flexible connections, a driveshaft and a clutch alternately throwing the two gearings in and out of connection with the driveshaft. The ladder is particularly adapted for use at fires, and may be provided with a water hose wound on a drum.

VEHICLE TIRE.—Angus McI. Williamson, Philadelphia, Pa. On the felly of a vehicle wheel, according to this invention, is a recessed flanged band a tire, of rubber or other resilient material, this portion of the tire being united to the felly by an interior rod or bar, whose ends are secured to the felly by a loop bolt, There is a leather strip covering the rod or bar, and outside of that an air space, to insure easy riding of the projections, making the action of the wheel steplike as it travels over the ground.

ROLLER ATTACHMENT FOR SLEIGHS.— James C. Perkins, Inwood, Iowa. At each side of the sleigh are pivoted roller carrying and lifting arms, the roller-carrying arms when in vertical position supporting the sleigh upon the roller, with the runners off the ground. The arms are held forwardly inclined above the ground when drawing the sleigh over snow, but when bare ground, a bridge, etc., are to be passed over, the arms are released, when a shoe on the end of each lifting arm engages the ground to lift the sleigh upon the roller, the roller arms then assuming a vertical position and the lifting arms swinging back. By backing the sleigh, the parts are again returned to the original posi tion, with the runners on the ground.

OIL GAS APPARATUS. — Joseph H. Baker, Brooklyn, N. Y. This invention provides a device whereby oil and steam will be perfectly mingled and atomized in an atomizer within a retort to produce a speedy and economic conversion of them into an illumi nating gas. A cylindrical casing adapted to be introduced into a retort is closed at one end, and near this end is an oil inlet, while near the open end is a steam nlet, there being a distributing nozzle secured to and projecting from the open end of the casing, while a curved atomizing nozzle is secured in the steam inlet and projects into the distributing nozzle

CARPET STRETCHER. - Joseph E. Drake, Biue Rapids, Kansas. 'This device affords better means for grasping the carpet to pull on it than the use of this paper.

means for temporarily holding the carpet after the slack has been taken up and until the edge can be nailed down. The body portion of the device has hinged on its front edge a clamping bar adapted to be brought into ngagement with a folded portion of the carpet full width of the clamp, whereby the strain is evenly distributed over the entire width of the stretcher.

RAISIN SEEDER.—Cary S. Cox, Fresno, To facilitate the rapid and cleanly removal of all seeds from raisins, without danger of cracking the seeds or tearing the fruit, this machine is made with a seeding cylinder from whose periphery extend teeth, while seed-receiving cylinder revolves in the direction of the seeding cylinder, the seed-receiving cylinder having a yielding separable surface in which are pockets for the reception of seed, the yielding surface being arranged to receive the rows of teeth on the seeding cylinder and retain the seed forced from the raisins by the teeth.

DISAPPEARING STORM HOUSE. -- Richard  $\Gamma$ . Bond, Atoka, Indian Ter. As a refuge in sections of the country where hurricanes and cyclones are not unknown, causing occasionally considerable loss of forming a channel for the reception of the inner part of life, this inventor has devised a retreat consisting essentially of a sunken pit in which is a vertical mast or post extending a little above the surface of the ground, while a cage or similar structure is adapted to slide down in the pit, the floor of the cage having a hole to receive the mast, and there being a hoisting apparatus comprising vehicle, while on the tread of the tire are integral spaced a cable guide attached to the top of the mast and winding apparatus attached to the floor of the cage. This storm house should be placed near the main house or residence, and may be made ornamental for use as a summer house, etc.

> PAPER WEIGHT AND SPONGE CUP.may be of glass, celluloid or metal, and has a central cuplike portion, connected at the bottom with a channel leading to one side, the channel terminating in a rubber bulb, by pressing upon which water is forced up into the cup, the surplus water being withdrawn when the bulb is released from pressure.

> TAG.-John G. Fisher, Hanover, Mass. This is a device especially adapted for attachment to the inside of overcoats, hats, capes and other garments, as well as upon bundles or packages, the body of the tag being preferably of metal, and the device including a fastening pin of simple form, but which will securely lock the tag in position.

#### Designs.

PENHOLDER SUPPORT. - Antoine H. Meloche, Whitney, Mich. This is a support adapted to be placed on a finger of the hand, to hold the pen in proper position for writing, so that the penholder need not be placed on a desk when not being used.

Note.-Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date

#### 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 the follow-

Marine Iron Works. Chicago. Catalogue free.

"U. S." Metal Polish. Indianapolis. Samples free. Yankee Notions. Waterbury Button Co., Waterb'y, Ct. Handle & Spoke Mchy. Ober Lathe Co., Chagrin Falls, O. For bridge erecting engines. J. S. Mundy, Newark, N. J.

For Sale-Patent No. 589,808, on Corn Row Marker Address O. Billingsley, East Cape Girardeau, Ill.

Improved Bicycle Machinery of every descript The Garvin Machine Co., Spring and Varick Sts., N. Y.

Concrete Houses - cheaper than brick, superior to stone. "Ransome," 757 Monadnock Block, Chicago.

If you have a quick-selling novelty, you ought to put it on the market. We will make it for you. Place & Terry, 247 Centre Street, New York.

Machinery manufacturers, attention! Concrete and mortar mixing mills. Exclusive rights for sale. "Ransome," 757 Monadnock Block, Chicago.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

The best book for electricians and beginners in electricity is " Experimental Science," by Geo. M. Hopkins By mail, \$4. Munn & Co., publishers, 361 Broadway, N. Y.

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 information and not for publication.

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

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

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

houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be

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.

Books referred to promptly supplied on receipt of

Minerals sent for examination should be distinctly marked or labeled.

(7227) J. R. asks: How many layers of No. 20 double-covered magnet wire shall  $\, \mathbf{I} \,$  use to wind ring armature for dynamo core 4% in. in diameter, 4 in. long, with 21/4 in. hole, composed of 23 washers, with writing paper between, all turned true and bored out? It will take about 300 turns of wire for the first layer and a few more for the next ones. What size wire shall I use for field winding, the magnet waists being  $5\frac{1}{2}$  in. long by 11/4 in. thick, composed of sheet iron bolted together and faced up smooth? I would like to run the machine in shunt or series, if it would be better. A. For the armature use 200 turns. The number in each coil will depend on the number of commutator bars. For the field use about 1,000 turns No. 26 wire, if shunt wound. We have assumed the voltage to be 110 and the speed to be 1,600 turns per minute.

(7228) P. M. N. says: Can you inform me if there is a process other than the chalk plate by which pen and ink drawings may be reproduced for newspaper work? If so, is it more complicated and expensive? I wish to find a way to make my newspaper cuts in the simplest, cheapest and most expeditious manner, and desire to install the process in the office. Kindly let me know if there is any way of doing this, and oblige. A. We do not know of any process other than the chalk plate for producing cheap newspaper cuts. The process of photo-engraving is largely used by the New York daily papers. The effect is better than that of the chalk plate. It will be necessary to purchase some books on the subject, as Anderson's "Photo-Engraving," \$5; Schraubstadter's "Photo-Engraving and Copy of Photo-Engraving," \$3.25; Farquhar's "Grammar of Photo Engraving," \$2; Jenkins' "Photo-Engraving," \$2, which we mail at the prices mentioned. Supplement No. 720, mailed on receipt of 10 cents, contains formulas for working the chalk process.

(7229) F. B. H. writes: I am an old reader of your valuable paper, and I want to ask a few questions in regard to the eight light dynamo described in Supplement, vol. xxiv. No. 600. My question is this: Can I double the drawings in every respect and get an operative machine? I mean one, if well constructed, that would answer as well as the eight light machine. If any changes are needful, please state what they are. Be sure to state size of wire for armature and field magnets, the winding being the same as in the eight light machine. Should I double the length and diameter of armature? To be short, if I were to double or multiply by 2 all the measurements given, would my machine be out of proportion? A. The sizes given in the drawings of the eight light dynamo can be doubled. This makes the machine 4 times as large. If it is wound with the same sizes and number of turns of wire as the original, it will have the same current in amperes, but 4 times the voltage. If the field is made larger, the armature should be increased in the same degree. Now. if you also use wires twice as thick, but have the same number of turns, the carrying capacity in amperes will be increased 4 times, and the total output of the machine will be 16 times as great. In place of No. 20 wires use No. 14 on armature. In place of No. 18 wire use No. 12

#### TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws 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

OCTOBER 26, 1897,

AND EACH BEARING THAT DATE.

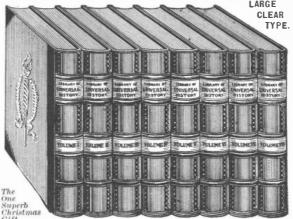
| See note at end of list about copies of these patents.]

	HORARY OF THE
Aerial machine, J. D. Graybill       592,704         Air brake, Westinghouse & Caldwell       592,461         Air compressor, F. M. Graham       592,266         Air engme, compressed, L. T. Gibbs       592,246         Alarm       See Fire alarm         Alarm       Gevice, automatic electric, P. V. Vander-tong for the property of the property	STORE STORE
Alarm device, automatic electric, P. V. Vandervelde.  Animal trap, W. T. Keefer. 592,543  Animal trap, R. Voras. 592,542  Automatic switch, C. Partington. 592,562  Axle box. W. Hyde. 592,531  Badge, W. Hornich, Jr. 592,561  Badde, W. Hornich, Jr. 592,660  Banjo belj, Jarvis & McLean. 592,762  Barrel head machine, J. Greenwood. 592,467  Bath and wash tub. combined folding, H. J. Gies. 592,244  Battery. See Electric battery.  Bed frame, folding, J. Levy. 592,658  Bedsteaf fastener. W. N. Fessenden. 599,689	S BOLINGE IN
Badge, W. Hornich, Jr.       592,610         Band, en dless, I. Bins       592,686         Banjo bell, Jarvis & McLean       592,732         Barrel head machine, J. Greenwood       592,467         Bath and wash tub, combined folding, H. J. Gles.       592,701         Bathing apparatus, M. B. Boyle       592,234         Battery.       592,224	The One Superb Christmas Gift. with the Club, a few or
Bed frame, folding, J. Levy.       592,653         Bedstead fastener, W. N. F'essenden       592,659         Beehive, K. De Kesel       592,626         Bell, electric vibrating, H. F. Albright       592,298         Belt and slat fastener, M. L. Akers       592,578         Bicycle attachment, J. H. O'Brien       592,438         Bicycle prake, F. Reitler       592,271	APPLICA' in order to
Bicycle brake, J. S. Foley       552,745         Bicycle brake, D. M. Peters       592,254         Bicycle brake, G. T. Warwick       592,559         Bicycle handle bar arip, W. Lampert       592,634         Bicycle lock, C. R. Eberle       592,242         Bicycle lock, C. H. Reed       592,481         Bicycle railway, C. L. Blubauch       592,567	GREAT WORK REALLY IS. other work ever publ Meissonier, De Neuvi) The Historical Me
Battning apparatus, M. B. Boyle.         32,254           Battery.         See Electric battery.         592,653           Bed frame, folding, J. Levy.         592,653           Bedstead fastener, W. N. Fessenden.         592,639           Beehive, K. De Kesel.         592,629           Bell, electric vibrating, H. F. Albright.         592,239           Beit and slat fastener, M. L. Akers.         592,248           Bicycle brake, F. Beitler.         592,248           Bicycle brake, J. Foley.         592,245           Bicycle brake, G. T. Varwick.         592,245           Bicycle brake, G. T. Varwick.         592,548           Bicycle handle bar ærly. W. Lampert.         592,534           Bicycle lock, C. R. Eberle.         592,248           Bicycle railway. C. L. Blubaugh.         592,541           Bicycle stand, Wabattak, Pearsons.         592,423           Bicycle stand, Wabattak, Pearsons.         592,432           Bicycle stand, Wabattak, Pearsons.         592,432           Bicycle support, B. Lo Forten.         592,432           Bicycle support, B. C. Spman.         592,432           Binder swathing attachment, A. P. Patterson.         592,232           Biodek. See Ctiling block.         See Ctiling block.	work, native or foreign instructive and valuable TOPICS OF The THE DAY. Mer Alaskan Boundary van Affair, "The Revolt in Cr.
Block   See Ceiling block   Boiler   See Tubular boiler   See Tubular boiler   See Tubular boiler   See Tubular boiler   See See See See See See See See See S	"The Revolt in Cr bistory of every imp and explained with a le maps and diagrams.  WORDS OF Pl
Bone black revivifying apparatus, A. E. Krause 592,547 Book cover folding and pressing machine, J. A. Moller 522,429 Boot or shoe making apparatus, P. I. Machis 522,237 Bottle, P. L. Hunt	Pres. E. Benjamin of Brown Universit "The educational value brary of Universal Hist to be very great."
Bougie, Miller & Moss	Dr. S. G. A. Brown burg, Pa., writes: "My set arrived to- more than pleased with be in every home and pr in the land."
Box. See Axle box. Feed box. Folding box. Match box. Box machine, B. A. Blakeney	at a saying of about sides affording easy if great magazines will to student, member of a
Bulkhead doors, apparatus for closing watertight, T. Moodie. 592,430 Bung and faucet, Kachel & Sager. 542,235 Burner. See Gas burner. Hydrocarbon burner. Burner, J. F. W. Grote. 592,545 Bushing for pulleys, Journals, etc., J. D. Adams. 522,504 Cake turner, E. R. Helgren. 592,630 Can. See Soda water can.	student, member of a demand has been so edition has been exha who apply during No work and the club pl and illustrations, incl Cabinet, smaller portr General Weyler. Nam
Can. See Soda water can.       592,298         Cap, W. A. Lattimore.       592,604         Car brake, C. Bresnahan       592,604         Car coupling, automatic, R. E. Bates       592,580         Car fender, J. P. Duval       592,58         Car fender, E. Tortoiseshell       592,555	Cabinet, smaller portr General Weyler, Tan ing map of Cuba, a nethe Klondike River at McCLURE'S M.
Can. See Soda water can.  Cap. W. A. Lattimore. 592, 298 Car brake, C. Bresnahan 592, 604 Car coupling, automatic, R. E. Bates. 592, 504 Car fender, J. P. Duvai. 592, 518 Car fender, E. Tortoiseshell 592, 525 Car fender or guard, tramway, D. Dotson 592, 241 Car protecting door, express, B. Oppenheimer 592, 539 Car steet, E. N. Gilfillan 592, 749 Car, street, G. F. Brown 592, 749 Cars, automatic coupling for steam and air pipes for railway, J. E. Marble 592, 579 Carding engine, J. Edge 592, 728 Carding engine, J. Edge 592, 728 Carding machine feeding mechanism, R. J. Hill 592, 708 Carpte beater, W. J. Bennett. 592, 559	WOO
Carding machine feeding mechanism, R. J. Hill. 592.708 Carpet beater, W. J. Bennett. 592.559 Carpet beater, J. T. Wye. 592.557 Caster, W. H. Tucker. 592.484 Ceiling block, T. C. Swinnerton. 592.482 Cement manufacture, V. Kjeldsen. 592.492 Centrfugal machine control apparatus. A. E. 592.492 Centriugal machine control apparatus. A. E. 595.462	FOOTAL
Krause 592,546 Chain, drive E. F. Morse 592,552 Chain, sprocket, J. B. Powell 592,713 Chains, auxiliary link for bicycle drive, J. P. Browning 592,775 Chair. See Folding chair. Checkrein retainer, J. H. Nicholes. 592,573	THE COPVING P
	by which thousanies are r
Rogers & Hall. 592, 563 Cigar mould, N. Du Brul. 592,627 Circuit breakers, contact in shunt for, W. M. Scott. 592,497	and how to use; with an abow to prepare the gelation by which the copies are netter to the pad, how to Contained in SCIENTIFIC 438. Price 10 cents. Frowsdealers in all parts of
Rogers & Hall. 592,5627 Cigar mould, N. Du Brul 592,627 Circuit breakers, contact in shunt for, W. M. Scott. 592,497 Cleaner. See Flat iron cleaner. Clip for tentering, stretching and drying machinery, J. & W. Horton. 592,707	PCWER& FOOT LATHES.M. SEBASTIAN LATHE CO.
Rogers & Hall. 592,583 Cigar mould, N. Du Brul 592,627 Circuit breakers, contact in shunt for, W. M. Scott. Cleaner. See Flat iron cleaner. Clip for tentering, stretching and drying machinery, J. & W. Horton. 592,614 Clock, chining, W. E. Porter. 592,614 Confectionery, etc., machine for coating, L. B. Lehmann. 592,688 Connecting rod, M. Coughlin. 592,487 Conveyer, H. Howson. 592,708 Cooler. See Milk cooler. 592,708 Copy holder, Dudley & Fogleson. 592,708 Corn sheller attachment, J. H. Gilman. 592,543 Cotton presses, core and core operating mechanism for, F. L. Dyer. 592,283 Coupling. See Car coupling. Pipe coupling.	PCWER& FOOT LATHES. M SEBASTIAN LATHE CO.
Rogers & Hall.  Cigar mould, N. Du Brul.  Soot.  Cleaner. See Flat iron cleaner.  Clip for tentering, stretching and drying machinery. J. & W. Horton.  Clock, chining, W. E. Porter.  Confectionery, etc., machine for coating, L. B.  Lehmann.  Connecting rod, M. Coughlin.  Conveyer, H. Howson.  Copy holder, Dudley & Fogleson.  Cotton presses, core and core operating mechanism for, F. L. Lyer.  Coupling. See Car coupling. Pipe coupling.  Crusher. See Stone or ore crusher.  Cultivator, E. H. Snyder.  Cultivator, E. Weed cutter.  Cycle pedal, E. W. Lincoln.  592,549	PCWER& FOOT ATHES. M. SEBASTIAN LATHECO.
Rogers & Hall.  Cigar mould, N. Du Brul.  Soot.  Cleaner. See Flat iron cleaner.  Clip for tentering, stretching and drying machinery. J. & W. Horton.  Clock, chining, W. E. Porter.  Confectionery, etc., machine for coating, L. B.  Lehmann.  Connecting rod, M. Coughlin.  Conveyer, H. Howson.  Copy holder, Dudley & Fogleson.  Cotton presses, core and core operating mechanism for, F. L. Lyer.  Coupling. See Car coupling. Pipe coupling.  Crusher. See Stone or ore crusher.  Cultivator, E. H. Snyder.  Cultivator, E. Weed cutter.  Cycle pedal, E. W. Lincoln.  592,549	PCWER& FOOT ATHES.M SEBASTIAN LATHE CO.
Rogers & Hall.  Cigar mould, N. Du Brul.  Soot.  Cleaner. See Flat iron cleaner.  Clip for tentering, stretching and drying machinery. J. & W. Horton.  Clock, chining, W. E. Porter.  Confectionery, etc., machine for coating, L. B.  Lehmann.  Connecting rod, M. Coughlin.  Conveyer, H. Howson.  Copy holder, Dudley & Fogleson.  Cotton presses, core and core operating mechanism for, F. L. Lyer.  Coupling. See Car coupling. Pipe coupling.  Crusher. See Stone or ore crusher.  Cultivator, E. H. Snyder.  Cultivator, E. Weed cutter.  Cycle pedal, E. W. Lincoln.  592,549	PCWER& FOOT ATTLE S.M. SEBASTIAN LATHE CO.  WALWORT 20 OLIVER STREET,  TRANSITS AND L.  NICKEL POCK Sizes, 24 and 34 inches.  For Boo C. F. RICH
Rogers & Hall.  Sout.  Cigar mould, N. Du Brul.  Sout.  Sout.  Cleaner. See Flat iron cleaner.  Clip for tentering, stretching and drying machinery, J. & W. Horton.  Clock, chining, W. E. Porter.  Confectionery, etc., machine for coating, L. B.  Lehmann.  Commetting rod, M. Coughlin.  Connecting rod, M. Coughlin.  Conveyer, H. Howson.  Copy holder, Dudley & Fogleson.  Cotton presses, core and core operating mechanism for F. L. Dyer.  Cotton presses, core and core operating mechanism for F. L. Dyer.  Southing. See Car coupling. Pipe coupling.  Crusher. See Stoe or ore crusher.  Cultivator E. H. Snyder.  Cuttery See Weed cuttee.  Cutter See Weed cuttee.  Cycle peda E. W. Lacon.  Cycle propelling and braking mechanism, G. Beek.  Cycle peda E. W. Lacon.  Cycle peda E. W. Lacon.  Cycle propelling and braking mechanism, G. Beek.  Cycle peda E. W. Lacon.  Cycle propelling and braking mechanism, G. Beek.  Cycle peda E. W. Lacon.  Cycle peda E. W. Lacon.  Cycle propelling and braking mechanism, G. Beek.  Cycle peda E. W. Lacon.  Cycle peda E. Cycle peda E. Southers.  Direct acting engine, J. D. Gray.  Bisinfecting device, F. E. Thomas.  Surfact Southers.  Southers Southers.  Door check, H. Bennewis.  Door check and closer. C. O. Case.  Dye, red azin. Heymann & Reyher.  Dumb waiter safety clutch, C. B. Cox.  Southers Southers.  S	PCWER& FOOT A BEBASTIAN LATHE CO.  PCWER& FOOT A BEBASTIAN LATHE CO.  WALWORT OF COLIVER STREET,  TRANSITS AND L.  NICKEL POCK  Sizes, 2½ and 3½ inches.  For Boo
Rogers & Hall.  Cigar mould, N. Du Brul.  Soot.  Cleaner. See Flat iron cleaner.  Clip for tentering, stretching and drying machinery. J. & W. Horton.  Clock, chining, W. E. Porter.  Confectionery, etc., machine for coating, L. B.  Lehmann.  Connecting rod, M. Coughlin.  Conveyer, H. Howson.  Copy holder, Dudley & Fogleson.  Cotton presses, core and core operating mechanism for, F. L. Lyer.  Coupling. See Car coupling. Pipe coupling.  Crusher. See Stone or ore crusher.  Cultivator, E. H. Snyder.  Cultivator, E. Weed cutter.  Cycle pedal, E. W. Lincoln.  592,549	PCWER& FOOT ATTHES ME SEBASTIAN LATHECO.  WALWORT  TRANSITS AND L.  NICKEL POCK  Sizes, 2½ and 3½ inches.  For Boo  C. F. RICH  P. O. Box 977.

acting engine. Gas engine. Pumping Rotary engine.
Engine, pump or compressor, W. A. Bole..
Envelope, W. H. Beecher....

## SPECIAL HISTORY CLUB For **NOVEM**

"I appreciate highly the purpose of the Club, which is to stimulate the study of history among the people. This knowledge is evidently the most important kind of self-knowledge. "I wish the Club all success in extending the distribution of such a valuable work on this subject."



OUR CLUB has proved so popular and the Club price and convenient terms so attractive and satisfactory that the demand has exhausted our original edition of the

# LIBRARY OF

the publishers have consented to supply another edition (limited in number) which will be distributed to the constant of the constant of the constant of the constant of the constant order of application, but is any oven the Club will close Ne-vember 30th and the price will be advanced.

BY SPECIAL ARRANGEMENT with the Club, a few of these sets have been set aside temporarily for SCIENTIFIC AMERICAN readers, but

#### APPLICATIONS SHOULD BE SENT IN AT ONCE in order to participate in the distribution at the present very low price.

WHAT THIS

The three great epochs. Ancient History, Medieval History and Modern History, naturally claim the principal portion of the Library, but Recent History, naturally claim the principal portion of the Library, but Recent History, naturally claim the principal portion of the Library, but Recent History, naturally claim the principal portion of the Library, but Recent History of Civer and the work ever published in this country. The History of History are more fully treated than in any other work, native or foreign. In every one of those vital features which constitute a comprehensive, accurate, instructive and valuable history of the world the Library is incomparable. It is the Largest, Latest, Best.

TOPICS OF The Library presents the only authentic history of "The Armenian Massacree," "The Transval Affair," "The Cuban Revolution," "The Evolt in Crete," together with the late bistory of every important nation, all illustrated and explained with a large number of new portraits, maps and diagrams.

History of the Library presents the only such that the subject of special treatment, which includes the LATE IT IS. history of the gold discoveries in the Klondike and other regions, with a new double-page map in four colors, from the latest U. S. Government and Canadian surveys and reports, showing the different routes to the gold fields, with photographic reproductions of scenes on the Yukon River.

#### WORDS OF PRAISE FROM THOSE WHO HAVE RECEIVED THE WORK.

Pres. E. Benjamin Andrews, of Brown University, says: "The educational value of the LA-brary of Universal History' is sure to be very great."

Dr. S. G. A. Brown, Shippensburg, Pa., writes:

"My set arrived to-day. I am more than pleased with it. It should be in every home and public library in the land."

Ex-Pres. Cleveland writes: "This history will fill an impor-tant place among publications in-tended to give wider familiarity with historical literature."

W. W. Lewis, Moorland, Mich., writes:

"The history arrived in good condition. I am delighted with it. I would not sell it for double the cost, if I could not get another set."

Pres. M. W. Stryker, of Ham-ilton College, says:
"The 'Library of Universal His-tory' will prove of high educational value in many households."

Rev. Francis W. Greene, Philadelphia, Pa., writes: "The binding, paper, type and il-lustrations are beautiful. I have never bought anything in my life that I am better pleased with, than I am with this set of books."

controls for the benefit of its members exclusively, the desirable first edition of this splendid Library, and by arranging for the entire edition at a saying of about 50 per cent of the regular subscription price, according to the styles of binding great magazines will thoroughly appreciate the superb Library of Universal History, and no teacher, student, member of a historical club or occasional reader should fail to investigate our club offer. The demand has been so great for these sets on the extremely favorable terms offered that the entire first edition has been exhausted, and a special limited edition arranged for, which will be distributed to those who apply during November. It is therefore advisible to write at one for full particulars regarding the work and the club plan and price. The club will also send you free an interesting set of specimen pages and illustrations, including full-page portraits of Herodotus, Franklin, and President McK inley and his Cabinet, smaller portraits of six great statesmen, also text-page portraits of Queen Victoria, Paul Krüger, General Weyler, Nansen the explorer, with eight reproductions of famous historical scenes, a large folding map of Cuba, a new double-page map of Alaska, photographic scenes on the Yukon River, and a chart of the Klondike River and its tributaries. Address all communications to

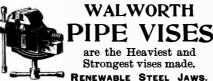
McCLURE'S MAGAZINE HISTORY CLUB. 141 E. 25th Street. New York



HE COPYING PAD.-HOW TO MAKE IN EVOLT 11NO F AD.—110 W 10 minds and how to use; with an engraving. Practical directions ow to prepare the gelatine pad, and also the aniline ink y which the copies are made, how to apply the writter to the pad, how to take off copies of the letter. Ontained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 3S. Price locents. For sale at this office and by all ewsdealers in all parts of the country.

695 Water St., Seneca Falls, N.Y.





WALWORTH MFG. CO. BOSTON, MASS

Transits and Leveling Instruments.

IICKEL POCKET LEVELS



izes, 21/2 and 31/2 inches. Prices, 40 and 50 cents C. F. RICHARDSON & SON ATHOL, MASS., U.S. A. 0. Box 977,

> GATES ROCK & ORE BREAKER, Steam Ore Stamp, MINING MACHINES, 50 years experience as builders. GATES IRON WORKS, Dept. C, 650 Elston Ave., Chicago. Mining Machinery,

ľ	LUB,	141	E.	25th	Street	, New	Yo	rk [
_	<u> </u>			-			***	
1	Envelor Excava	pe, H.	J. R	athjen, vatercou	Jr rses, conve	eyer for m	ak-	592,444
	Excavat	irtific	ial, A for	waterc	rises, conve ourses, ap ourses, ap ourses, ap ourses, ap riffer, E. R. Stilwell. k. Sson. , P. Frantz. nderson. oss.  see.  we. W. H. edy. erman. W. Steve nger.	paratus	for	592,657 509 658
	Faucet,	meas	uring	z, E. Bo	ening			592,274 592,262
	Feed wa	iter h	eate urifl	rand puer, E. R.	rifler, E. R Stilwell	. Stilwell.		592,670 592,671
	Fence r Fence,	nachi panel,	ne, ( T. J	C.O. Bed Thomp	son			592,228 592,456
	Fence p Fence s	tay m	achi	Allen ne, wire	, P. Frantz		· · · · · ·	592,680 592,727
	Fender.	See	Car Car	fender.	nuerson			509 999
	Fifth w	heel. W. T.	W. C	. Parsor	18	· · · · · · · · · · · · · · · · · · ·		592,712
3	Filter, S Filter, C	Speer 3. H.	& M War	cLean	· · · · · · · · · · · · · · · · · · ·			592,742 592 675
	Fire ala	rm, S	taple Lejec	s & Spal	ke vice, W. H.	Davenpo	rt	592,643 592,239
i	Fire esc	ape, J	I. De Sant	mpster. & Zimm	euy erman	• • • • • • • • • • • • • • • • • • • •		592,140 592,582 592 150
•	Fish cle Fish ho	aning	ma ok, F	chine, G . W. Kli	. W. Steve	nson		592,500 592,493
	Fishing Fishing	reel,	H . M.	1 cNult a Kenyor				592,593 592,613
	Flower	n clea	ner, tach	O. S. Br ment, C	adley . W. Wern	er		592,560 592,556
	Folding	box,	C. &	F. H. P.	eck	· · · · · · · · · · · · · · · · · · ·	• • • • •	592,042 592,253 502 605
,	Fruit di Fruit so	rier. E	3. L. er. C.	Ryder Leigh.			· · · · · ·	592,256 592,652
)	Furnac Furnac	ė, J. ( es, <sub>"</sub> pr	l. Sa otec	nderson tive arc	h plate fo	r mouths	of	592,616
	Game a	er, B. ppara	tus,	amprey D. Smitl	adley			592,635 592,498
	Garmer	it sup	port	er, E. E. lene. Le	Phillips			592,479 509 904
	Gas eng Gas ger	ine, ( ierato	. Si	ntz J. Burt				592,669 592,605
	Gas shu	itoff. a See Ir	riga:	natic, C ing dite	. E. & W. S h gate. Sl	chuster iding gate		592,597
	Gear ca	ise fo	r spi	ocket a	nd chain	drives, C	B.	592,251
•	Gear fo	r rolli ouldin	ng si	tock, P.	Ellis F. Kepp			592,540 592,566
	Gear, re	eversi tor.	ng, . See C	l. H. Th as gene	erien rator.		••••	592,483
	Govern Grain d	or, en rier, J	gine J. Ku	, E. W. I rtzwort	Erickson h ng apparatı			592,529 592,530
	dall Grain n	ievati	ng oi	dumpn drier	E E Cozole	18, W. F. R	·en-	592,650 502,691
	Grapho Gun ba	scope rrel, I	, L. )	H. Cohe erhamn	n			592,693 592,437
•	Gunpov Hair di	vder, rier, e	mak i lect r	ing, C. V ic, H. F	V. Volney utterer	· · · · · · · · · · · · · · · · · · ·		592,485 592,245
	Hanne Hamme	O. C. er, E.	Jon C. Cl	ark	g apparati E. F. Cazale 1	· • • • • • • • • • • • • • • • • • • •	••••	592,292 592,278
	Hanger	ter, c	Pip orn,	e hange	r. me			592,618
	Harves Harves	ter cu ter el	evate	mecha or, H. F.	rism, corn Crandall	.W. R. B	ıker	592,720 592,280
	Harves Hasp lo	ter kn ock, J.	R. f	r, W. M. Bridges.	Sheets	oldman:	<b></b>	592,514 592,527
	Hat and	d coat tener	lock	аск, Ku i, J. D. I E Сатаг	enzie & Po Burns bell	emmann.	····•	592,276 592,276
	Heater Hook a	. See	Fee e, l.	d water P. Kim h	r. one one hism, corn Crandall Sheets enzle & Po Burns bell heater.			592,296
	1	•	((	Continu	ed on pag	e 302)		

#### ELECTRICITY

Machine Design; Stationary, Locomotive and Marine Engineering; Miniug; Mechanical and Architectural Draw'g; Architecture; Plumbing; Railroad, Municipal, 31 COURSES & Bridge Engineering; Surveying and Mapping; Shee Metal Pattern Cutting; Metal Prospecting Bookkeeping; Shorthand; English Branches Bookkeeping; Shorthand; Eugust States at Market GUARANTEED SUCCESS.



#### ARMSTRONG'S PIPE THREADING

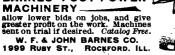


**CUTTING-OFF MACHINES** 

Both Hand and Power.
Sizes 1 to 6 inches.
Water, Gas, and Steam Fitters' Tools, Hinged Pipe Vises.
Pipe Cutters. Stocks and Dies
universally acknowledged to be
THE BEST. 18 Send for catalog. THE ARMSTRONG MFG. CO. Bridgeport, Conn.

## WORK SHOPS

of Wood and Metal Workers, with-out steam power, equipped with BARNES' FOOT POWER





We can furnish the Latest Improved Eyelet Machines for making shoe eyelets and special eyelets of all descriptions. We are also builders and designers of Special Wireworking Machinery. Send for Circular.

#### BLAKE & JOHNSON,

P.O. Box 7, WATERBURY, CONN., U.S.A.

Pipe Threading Machines of Highest Merit.

Bignall & Keeler Mfg. Co.,



ACETYLENE GAS AND CARBIDE OF ACETYLENE GAS AND CARBIDE OF Calcium.—All about the new illuminant, its qualities, chemistry, pressure of liquefaction, its probable future, experiments performed with it. A most valuable series of articles, giving in complete form the particulars of this subject. Apparatus for making the gas. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. Nos. 398, 1004, 1007, 1012, 1014, 1015, 1016, 1022, 1035 and 1038. The most recent apparatus of simple and more elaborate type described and illustrated in special acetylene Supplement No. 1057. Price 10 cents each. To be had at this office and from all newsdealers.

#### 50 Per Cent Increase **POWER** at no additional expense. VICTOR VAPOR ENGINE.

Local Agents Wanted. Steam and Vapor Launches, Row and Sail Boats.

THOS. KANE & CO.,



This beats Wind, Steam, or Horse Power. We offer the WEBSTER 2½ actual horse power

WEBSTER 2% actual norse power GAS ENGINE
for \$150, less l0t discount for cash.
Built on interchangeable plan. Built of best material. Made in lots of 100 therefore we can make the price. Boxed for shipment, weight 300 pounds. Made for Gas or Gasoline.

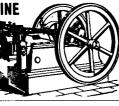
BY Write for Special Catalogue.

WEBSTER M'F'G CO., 1074 West 15th Street, CH1CAGO.

#### GAS and GASOLINE ENGINES.

Using Natural Gas, Coal Gas, Producer Gas, and Gasoline di-rect from the tank. 1 to 40 H. P., actual.

The Springfield
Gas Engine Co.
21 W. Washington St
Springfield, O.



## VAPOR LAUNCH Complete

BOW, SAIL and STEAM BOATS. 101 \$150.

EW Send five cente for Catalogue.

BACINE YACHT AND BOAT WORKS,

Racine Junction, Wis., Box A.

#### **CREENFIELD** Steam Engine Works.

Established 1874.

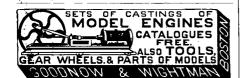
Manufacturers of Greenfield Stationary, Portable and Yacht

ENGINES AND BOILERS. Also Horizontal, Automatic and Variable Cut-off Engines. Sizes from 3 to 73 Horse-Power.

Also Vertical and Horizontal and
Marine Bollers, Steam Pumps
and Adams' Grate Bars.

W. G. & G. GREENFIELD, East Newark, N. J.

THE MACHINERY OF A NAPHTHA Launch.—A detailed description of the motive power of a Modern Naphtha Launch, with sectional views showing all the parts of the boiler and engine. A most valuable paper. 4 illustrations. Contained in SUPPLE-MENT 1104. Price 10 cents. For sale by Munn & Co. and all newsdealers.



HYPNOTISM Easy mailcourse for investigators, Exhibitors. Lecturers, and Heaters. Valuable information and illus. booklet on request. Prof. Americans, S. A. 16, Macmie Temple, Chicago.

# Hook and eye, B. F. Orewiler..... Horseshoe, J. Kass.....

Liquids, apparatus for electrically treating, F.

Jones. 592,735

Lock. See Bicycle lock. Hasp lock. Hat and
coat lock.

Lock Draullette & Catois. 592,606

Lock Orntrolling, Becker & Minsart. 592,623

Logging machine, G. T. Glover. 592,731

Match box, pocket, H. Witz. L. Aronson. 592,237

Match box, pocket, H. Witz. 592,538

Match splint forming and colling machine, C. F.

Scamman et al. 700,000

J. Wadsworth. 592,741

Measuring and folding fabrics, etc., machine for, J. Wadsworth. 592,636

Measuring cloth, etc., machine for, R. E. L. J.

Lovell 100,000

Lovell 100,000

Lovell 100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,000

100,

Loven.

Measuring cloth, paper, etc., machine 101, ...

Hyde.

Measuring device, S. O. Jones.

Metal surfaces, apparatus for cleaning cast, D. C.

Metal surfaces, apparatus for cleaning cast, D. C. Measuring device, S. O. Jones
Metal surfaces, apparatus for cleaning cast, D. C.
Green. 592,736
Meter apparatus, coin freed, J. F. Simmance. 592,636
Milk cooler, J. Barnhart-etlal. 592,231
Millstones, pick for edging, H. Warncke. 592,235
Mould. See Cigar mould.
Monkey wrench, E. B. Sankey. 592,835
Mottor. See Vehicle motor.
Nail making machine, G. Goddu. 592,729
Nailing and stapling machine, Quickert & Larson. 592,635
Nailing implement, hand, J. W. Graudle. 592,235
Oil extracting apparatus, N. F. Ryder. 592,235
Oil treating apparatus, N. F. Ryder. 592,235
Oil treating apparatus, N. F. Ryder. 592,235
Oil treating apparatus, N. F. Ryder. 592,240
Packing machine, J. H. Day
Packing machine, J. H. Day
Pall ear and spring catch, combination, C. W.
Baker. 592,430
Panning and concentrating machine, J. H.
Coombs. 592,233
Aper perforating machine, A. Greenleaf. 592,636
Paper sheets, device for feeding, C. H. Heywood. 592,233
Pencil, adding, W. W. Brown
Pencil, adding, W. Brown

Plano player, automatic, Parker & White.
Pile of weft pile fabrics, machine for cutting, G.
Royer.
Pipe coupling, F. Barnhart.
Pipe coupling, fexible, J. C. Davis.
Pipe coupling, frain, J. E. Marble.
Pipe hanger, A. J. Beaton.
Pipes, automatic coupling for train, J. E. Marble.
Pipes, automatic coupling for train, J. E. Marble.
Plant protector, E. F. Orner
Planter, T. J. Sullivan.
Planter, potato, T. A. Galt.
Pocket knife, H. G. Johnson.
Pocket knife, G. Meyer.
Pool triangle, W. D. Powell.
Post. See Fence post. Lamp post.
Power transmitsion, electrical, T. J. Fay.
Power transmitsion, electrical, T. J. Fay.
Power transmitting device, F. J. Noechel.
Printing machine, address, F. D. Belknap.
Printing press, H. F. Bechman.
Printing press delivery attachment, M. N. Cormack.
Printing press inking device, plate, J. T. Robert

mack.

Printing press inking device, plate, J. T. Robertson.

Puller. See Staple puller.

Pump, J. Lockwood......

Pump and rotary motor, rotary, F. Closs......

Pump for hydraulic elevation, etc., jet, L. A.

Conord...... Conord.

Pumping engine, C. N. Scott.

Pumping or raising liquids, apparatus for, J. Keith.

592,557

Razor safety guard, M. S. Jacobson.
Reapers or mowers, antifriction clip for, F. Barclay.
Refrigerating apparatus, compression pump for, H. J. Campbell.
Roller. See Shade roller.
Rotary engine, S. E. Ferguson.
Sash fastener, G. E. Strout.
Sash fastener, H. Toops.
Sash fastener, H. Toops.
Sash fastener, H. Toops.
Sash statener, A. M. Tyler.
Saw buck, E. Lindsay.
Saw buck, F. H. Morris.
Saw swaging machine, R. Jones.
Scoop or shovel, creen, C. R. Eads.
Scoop or shovel, creen, C. R. Eads.
Scaper, wheel, J. B. Grayer.
Seat. See Buggy seat. Car seat.
Seed distributer, S. Hardley.
Sewing machine, W. N. Parkes.
Sewing machine for lasting boots or shoes, N. & G. G. Goddu.
Shade holder, M. D. Greengard.
Shade supporter, Stitt & Marcus.
Shades, machine for cutting window, E. Oswald Shaft support, T. G. Coleman.
Shaft, vehicle, F. D. Bernier.
Shaking bolt, D. Sewell.
Sharpening device, scissors, J. T. Borden.
Shearing machines, yielding extensible cloth rest for, A. Brown.
Sheet assembling device. J. Larrabee.
Sheet metal pipes, construction of, J. F. Weitzel.
Ships, ventilator valve for, J. McCreery.

Ships, ventilator valve for, J. McCreery. 592,531
Ships ventilator valve for, J. McCreery. 592,531
Ships wells being stretched, clamp for holding,
A. E. Whitney. 592,682
Shutter fastener, H. F. Bente. 592,654
Signal See Railway signal.
Signal Sox cutout, electric, L. W. Miller. 592,427
Sliding gate and latch, M. P. Frantz. 592,658
Slubbing, intermediate, and roving frame, C. F.
Alinsworth. 592,653
Slubbing machine, can, T. B. Phelps. 592,430
Soldering machine, can, T. B. Phelps. 592,663
Spool holder, T. J. Murray.
Stacker discharger, pneumatic straw, Toner &
McCollum. 592,673
Stacker discharger, pneumatic straw, Toner & McCollum. 592,673

Spool holder, T. J. Murray.

Stacker discharger, pneumatic straw, Toner & McCollum.

522.672

Stacker, pneumatic straw. Toner & McCollum.

522.673

Staple puller. W. W. Krutsch.

522.673

Stean table, G. W. Kelley.

522.501

Step, J. Reynolds.

522.462

Stereopticon, W. S. Scales.

522.575

Stirrup, W. F. Hollister.

522.563

Stirrup, Spring. W. F. Hollister.

522.588

Stone or ore crusher. A. C. Hilsinger.

522.588

Stool. coin controlled folding. F. Behlow.

522.588

Stove safety plate, F. H. A. Devlin.

522.581

Stove safety plate, F. H. A. Devlin.

522.281

Stoves or furnaces, oil vaporizing attachment

for. T. P. Margeson.

522.581

Sugar, extracting, W. Feld.

522.583

Sugar, extracting, W. Feld.

523.583

Switch. See Automatic switch. Railway switch.

Switch See Steam table.

Switch face plate, flush, G. W. Hart. 592,417 to 592,425
Table. See Steam table. 592,249
Tablet arm, Linn & Lytle. 592,471
Telegraph transmitter for ocean cables, D.
Lynch. 592,494

(Continued on page 503)

if your dealer does not supply you, we mail them—to any address—postpaid on receipt of price.

Williams' Shaving Stick, 25 cts.
Genuine Yankee Shaving Soap, 10 cts.
Luxury Shaving Tablet, 25 cts.
Swiss Violet Shaving Cream, 50 cts.
Jersey Cream (Toilet) Soap, 15 cts.
Williams' Shaving Soap (Barbers'), Six
Round Cakes, 1 lb., 40c. Exquisite
also for toilet. Trial cake for 2c. stamp

THE

Glastonbury,
Conn., U.S.A.
LONDON, 64 Gt. Russel St.
SYDNEY, 161 Clarence St.

WOLVERINE" GAS AND GASOLINE ENGINES, STATIONARY The "Wolverine" is the only reversible Marine Gas Engine on the market. It is the lightest engine for its power. Requires no licensed engineer Absolutely safe. Manufact'd by WOLVERINE MOTOR WORKS, 12 Huron Street, GRAND RAPIDS, MICH.

#### HOISTING ENGINES

Gas and Gasoline En-gine Co., 402 S. W. Boulevard, Kansas City, Mo.



#### ALCO VAPOR LAUNCH



592,69

Motor controlled from bow. Valve movement, 12 to 1. 16 to 60 ft. Launches. Twin Screws a specialty. 1. 2, 3. 5, 7, 12, 14 and 20h. p. No licensed engineer or pilot required. Speed and safety guaranteed. No dangerous Naphtha or Gasoline used. No disagreeable vibration.

Send 10 cents in stamps

Marine Vapor Engine Co., ft. Jersey Av., Jersey City, N. J. ROTARY PUMPS AND ENGINES Their Origin and Development.—An important series of papers giving a historical resume of the rotary pump and engine from 1588 and illustrated with clear drawings showing the construction of various forms of pumps and engines. 38 illustrations. Contained in SUPPLEMENTS 1109, 1110, 1111. Price 10 cents each. For sale by Munn & Co. and all newsdealers.



BALL BEARING AXLES AND RUBbeating and perfect AALES AND RUB-ber Tires.—A paper read before the Carriage Builders' National Convention, Philadelphia, October, 1894, showing the advantage to be derived from the use of ball bearings and pneumatic tires in road vehicles. Contained in Scientific American Supplement, No. 9992. Price 10 cents. To be had at this office and from all newsdealers.



Anyone sending a sketch and description may quickly ascertain our opinion free whether an invention is probably patentable. Commun leations strictly confidential. Handbook on Patents sent free. Oldest agency for securing patents. Patents taken through Munn & Co. receive specialnotice, without charge, in the

## Scientific American.

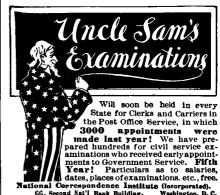
A handsomely illustrated weekly. Largest circulation of any scientific journal. Terms, \$3 a year; four months, \$1. Sold by all newsdealers.

MUNN & CO.361 Broadway, New York Branch Office, 625 F St., Washington, D. C.

# WILLIAMS' SOAPS are for sale everywhere, but EXCELL ALL OTHERS IN THE PECULIAR SOFTENING ACTION ON LATHER.

#### MECHANICAL DRAWING

and Surveying taught by mail. Terms very reasonable. Catalogue free. Black Corresp. School, Paterson, N. J.



"INSTRUMENTS OF PRECISION."

GG. Second Nat'l Bank Building,



## The Picture Way



is the best way to a child's mind. A pretty or strange picture stays, where a verbal description slips away. In day school and Sunday school, a Stereopticon is the teacher's most efficient ally. If you doubt or are ignorant of the scope of the instrument, send 20 cents for our catalogue of slides. There are tens of thousands of picturesque scenes of travel, land-scape, history, adventure, etc., that you can rent at low rates. Hire lists free.

#### RILEY BROTHERS,

Bradford, Eng. 16 Beekman St., New York

The Largest Stereopticon Outfitters in the World. BRANCHES-BOSTON: 36 Bromfield St. CHICAGO: 69 Washington St. KANSAS CITY, Mo.: 515 East 14th St. MINNEAPOLIS: 22 Washington Ave. So.

#### DORMAN'S VULGANIZERS

are used all over the world.

Exclusive Manufacturers of Steam Machines for Rubber Stamps. We also make Dry Heat Vulcanizers. Complete outfits from \$10 to \$1,000. All Stamp and Stencil Tools and Supplies. Brass and Steel Dies for all purposes. Scals, Engraving and Die Sinking of all kinds. Established 1860. Printing Presses, with complete outfits, from \$1 to \$100. Established 1860. From \$1 to \$100. Established 1860. The stablished 1860. The stabl





BICYCLE TIRE REPAIRING.—THE Mending of Single Tube Tires.—A practical article illustrating the method of inserting patches and pluggers, together with rubber band plugging and the use of puncture bands. 3 illustrations. Contained in Supplement 1102. Price 10 cents. For sale by Munn & Co. and all newsdealers.



BELTING of Various Styles, ELEVATORS, CONVEYORS, Chain 4 COAL MINING and HANDLING MACHINERY. The JEFFREY MANUFACTURING CO., COLUMBUS, O. Send for late Catalogue "C." Branches: CHICAGO—NEW YORK. Send for late Catalogue "C."

KRAFTUBERTRAGUNGSWERKE RHEINFELDEN. Society for the Utilization of the Water Power of the Rhine N. Bale, Switzerland.

16,800 H. P. NOW AVAILABLE, TO BE INCREASED TO 30,000 H. P. The Company is in a position to let electric energy at exceptionally cheap rates and on the most favorable terms. They also offer to applicants wishing to establish themselves near the works, suitable land on either the German (Badish) or the Swiss side of the Rhine, in the vicinity of important railway lines. Cheap labor.

For further information please address The Manager, Kraftubertragungswerke, Rheinfelden, Switzerland.



The Printing Press,

Paper, type, ink, illustrations and artistic designs covered fully in The Inland Printer,

The leading trade paper in the world devoted to the printing and allied industries. Matter fresh and original each month, contributed by experts. Every page a specimen of fine art in printing. Price, \$2.00 a year, 20c. a month.

THE INLAND PRINTER CO., 212-214 Monroe Street, CHICAGO.

Are you interested in acetylene-gas, calcium ATE YOU IIILETESLEU gas, cálcium carbide, gas engines, coal, coke, petroleum, gas, water, electricity or chemistry, or engineering generally? If you are, send two cent postage stamp to PROGRESSIVE AGE, 280 Broadway, New York, and get list of valuable articles prepared by some of the most eminent writers of the time on these and many other technical subjects. Synopsis accompany title, and will enable you to judge character of same and whether you wish copy.

IT COSTS NOTHING TO TRY! All steam users can save time money and trouble with the simplest. safest and most satisfactory trap in existence—the HEINTY.

ESTABLISHED 1874. The trap free. The see illus. notice Sci. Am. July 13, 1897. Sole American Mfr.

Wm. S. Haines, S 136 S. 4th St., Phila., Pa.

WELL DRILLING MACHINERY, MANUFACTURED BY WILLIAMS BROTHERS. ITHACA, N.Y. MOUNTED OR ON SILLS, FOR DEEP OR SHALLOW WELLS, WITH

STEAM OR HORSE POWER SEND FOR CATALOGUE ADDRESS WILLIAMS BROS. THAGA.N.



LEAD PENCILS, COLORED PENCILS, SLATE PENCILS, WRITING SLATES, STEEL PENS, GOLD PENS, INKS, PENCIL CASES IN SILVER AND IN GOLD, STATIONERS' RUBBER GOODS, RULERS,

COLORS AND ARTISTS MATERIALS.

78 Reade Street, - - - New York, N. Y.
Manufactory Established 1761.

#### **NEW LIGHT**



for Lantern Projection is the Acetylene Gas, which can be produced during exhibition, and the light is perfectly white and its light power is over 200 candles. Gas genera-tors, jets for any lantern, and calclum carbide for sale by QUEEN & CO., Inc., 1011 Chestnut St., Philadelphia, Pa.

SCREW-CUTTING DIE HEADS SELF-OPENING and ADJUSTABLE.

The best die head on the market. Some advantages over "others," viz.: They are smaller, stronger, more compact, have no levers to spring, cannot be clogged by chips, are always reliable, and the prices are right. \*\* Send for descriptive circular "S A." Our die heads are furnished in sizes suitable for cutting threads from the gauge to 6 inches diameter inclusive.

No. 17 wire gauge to 6 inches diameter inclusive.

CEOMETRIC DRILL CO., WESTVILLE, CT.,
EUROPEAN AGENTS: HAR. GRUCHILL & CO., London. England,
EUROPEAN AGENTS: WHITE, CHILD & MENEY, Vienna, Austria.



#### **TYPEWRITERS** HALF PRICE

We will sell you any typewriter made for one half regular price, many for one quarter. Every machine guaranteed in perfect order. TYPEWR ITERS SOLD, KENTED, EXCHANGED. Sentanywhere withprivilege of examination. Send for Illeget the state of the sentence.

National Typewriter Exchange, 214 La Salle St.,

HAWKINS' NEW CATECHISM OF ELECTRICITY



PRACTICAL TREATISE

PRACTICAL TREATISE

for Engineers, Electricians, burner and Amateurs. 550 pages 300 illustrations, bound in leather, pocketbook form, gold titles and edges. Strictly "Up-to-Date." Postpaid, \$2.00. THEO. AUDIEL & CO... 63 Fifth Avenue, New York,

#### SO SIMPLE A CHILD CAN USE THEM



SUNART MAGAZINE CAMERA. Folding Cameras.

All sizes, ranging in price from \$5 to \$100. Sunart Junior, 3% x 3% picture, \$5.

For Send 2 cent stamp for illustrated Catalogue.

SUNART PHOTO CO. 5 AQUEDUCT STREET, ROCHESTER, N. Y.

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 he 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.

Watchman's Improved Time Detector
with 12 or 24 Keys, with
Safety Lock attachment. Patented
1875-6-7. My inventons, and will sue
all concerns selling
or using the Safety
Lock attachment.
according to Decision of Circuit
Court of U.S. for
S. D. of N.Y.
Send for circulars to

DISCOUNTS Lowest Cash Discounts allowed on Architectural, Scientific, Electrical, Mechanical, Industrial and Technical Books. 27 Catalogue and Discount Sheet Free. WILLIAM T. COMSTOCK. 23 Warren St., New York.

Ĩ	1	1
	Telephone switchboard apparatus, F. R. Mc-	
1	Berty	92,431
	m-1h	02,401
	Telephone switchboard spring jack, M. G. Kel-	ايبيم
- 1	Telephone switchboards, cutoff relay for, F. R.	92,416
	Telephone switchboards, cutoff relay for, F. R.	
	McBerty	92,432
	Telephone swischboards, pilot lamp for, C. E.	- 1
	McBerty	92,452 92,638 92,718
.		42,638
	Thill coupling, A. L. Thompson et al. 5 Thread or silk holder, E. L. Schroeder. 5 Thread package, A. B. Morse. 5 Tile, J. J. Merrill. 55	05.718
	Thin coupling, A. L. I nompson et al	10) 421
u	Thread or slik holder, E. L. Schroeder	92,451 92,592
	Thread package, A. B. Morse	92,592
	Tile, J. J. Merrill 5	92,474
	Tire fastener, pneumatic, H. A. Porter 5	92,480
	Tobacco knife, W. Cole, Jr	92 538 1
	Tongs sunitary I W Stanhans 5	92,499
	Tow denoing Saladoo & Cathor	02,257
1	Toy, dancing, Salauce a Cathel	92,499 92,257 92,567
1	Toy, ngure, K. Kleemichen	00,000
	Traction wheel, w. Bedermeyer	92,683
	Trap. See Animal trap. Sealtrap.	
-	Treadle attachment, J. F. Wilkinson 5	92,577
	Trestle, F. Ring 5	92,574
	Trolley, conduit railway, W. Luer 5	92,577 92,574 92,711
	Trousers, M. M. Corwin	92,696
	Trousers, J. W. Madden	92,473
	Tile, J. J. Merrill.  Tire fastener, pneumatic, H. A. Porter.  Tobacco knife, W. Cole, Jr.  Tongs, sanitary, J. W. Stephens.  Toy, dancing, Saladee & Cather.  Toy, figure, R. Kleemichen.  Traction wheel, W. Bebermeyer.  Trap. See Animal trap. Seal trap.  Treadle statchment, J. F. Wilkinson.  Treatle, F. Ring.  Trolley, conduit railway, W. Luer.  Trousers, M. M. Corwin.  Trousers, M. M. Corwin.  Trousers knee protecting attachment, E. H.  Lunken.  5	,
	Tunkon A Lunkon	92,550
- 1	Dunken	03.000
-	Truck, car, M. B. Schaner	92,258 92,748
4	Trunk, theatrical, F. C. Beattle	92,748
	Lunken       5         Truck, car, M. B. Schaffer       5         Trunk, theatrical, F. C. Beattie       5         Tubular boiler, J. N. Rice       5	92,511
	Tumblers, etc., machine for finishing, J. R.	- 1
	Bridges 5	92.645
	Turning machine wood W T Iones 5	92 737
	Type instifying machine C W Powren	02,443
	Up b classifying inactifile, C. W. Bowton	100 5110
٠.	Tubular boiler, J. N. Rice.  Tumblers, etc., machine for finishing, J. R.  Bridges.  Turning machine, wood, W. T. Jones.  Type justifying machine, C. W. Bowron.  Upholstering apparatus, A. Freschl.  Upholstering device, F. R. Bacon.  Valve, A. G. Cassidy.  Sylve, O. F. Comite.  Valve, Neeland & Rotthoff.  Valve, Probeller, plug check, G. S. Thompson.  Valve, piston, B. F. Wilson.  Valve pring adjustment, W. F. Niebling  Vehicle, motor, C. H. Barrows.  Sychicle motor, J. M. Trotter  55	00,000
٠.	Upholstering device, F. R. Bacon	92,270
	Valve, A. G. Cassidy 5	92,625
'	Valve. O. F. Conihe 50	92,279
ш	Valve, Neeland & Rotthoff	92,478
:	Valve for boilers, plug check, G. S. Thompson 5	92.501
	Valve piston R & Wilson 5	92 644
1	Valve enring adjustment W k Nichling 5	02,434
.	Valida motor C U Parrows	02,682
- 1	Vehicle motor, J. M. Trotter	00 674
	Venicle motor, J. M. Trotter	00,400
	Ventilating apparatus, Harris & Evans. 5 Vote recording apparatus, W. H. Howe. 5 Voting machine, C. Christensen. 5 Wagon track, W. McClelland. 5 Waist, skirt, and belt holder, combined, G. N. Suck	92,468 92,590
1	vote recording apparatus, W. H. Howe 5	92,590
	Voting machine, C. Christensen 5	92,092
	Wagon track, W. McClelland 5	92,433
	Waist, skirt, and belt holder, combined. G. N.	
	Buck 5	92,464 92,738
	Wall, bulkhead, etc., retaining, W. V. Judson 5	32.738
	Warn threads machine for drawing in I D	·-,
	Charman Haculie IVI Ulawing III, L. F.	00 007
	Suerman	00,000
	wasning machine, G. M. Beck 5	92,667 92,229 92,694
	Washing machine, S. D. Cole 5	92,694
	Web drier looping machine, L. Wimmer 5	92,677
	Weed cutter, L. Agur 5	92,268
	Well drilling machine, F. R. Yearian	92,678
	Wheel. See Fifth wheel. Traction wheel	,0.0
	Wig maker's appliance H E Ehert	92,243
- 1	Waist, Skirt, and belt holder, combined, G. N. Buck. 5 Wall, bulkhead, etc., retaining, W. V. Judson. 5 Warp threads, machine for drawing in, L. P. Sherman. 5 Washing machine, G. M. Beck. 5 Washing machine, S. D. Cole. 5 Web drier looping machine, L. Wimmer. 5 Weed cutter, L. Agur. 5 Wheel. See Fifth wheel. Traction wheel. Wig maker's appliance, H. E. Ebert. 5 Winding machine, adjustable, C. L. Stacy. 5 Winding machine, adjustable, C. L. Stacy. 5	
	Winding machine, adjustable, C. L. Stacy	92,454
J	wire cords or cables, machine for making, W. H.	00 450
ı	H. Sisum 5	92,453
П	H. Sisum	92,679
Ш	Wrench. See Monkey wrench.	
Ш	Wrench, J. P. Forsberg 5	92,285
Ш	Wrench. See Monkey wrench. Wrench, J. P. Forsberg	92,476
П		,
П	·	
Ш		1
١	DEGLGMG	

#### DESIGNS.

	Bag, hand, L. Sanders	27,77
	Bicycle pedal arm, Anderson & Toitras	27,77
	Butter mould stamp, J. L.Dickinson	27.78
	Can opener blade, J. J. Gallman	27 78
	Carpet, A. K. May	27.80
	Carnet A M Rose 97 700 to	27 79
D	Carpet, A. M. Rose	27 78
	Flour bin stand, A. Gander	27 79
	Came board H. I. Heekell	27 70
	Game board, H. L. Haskell	27,70
	Game board, C. W. Wood	97.77
•	Lever, jack, G. Oldham	21,11
•	Match safe, La Rouche & Baker	21.77
	Stopper, wooden, W. C. Estes	27,78
_	Stove door, E. G. Gerner	27,78
2	Target. flying, A. Barton	27,78
•	Towel rack frame, I. Osgood	27,78
	Stove door, E. G. Gerner. Target. flying, A. Barton. Towel rack frame, I. Osgood. Umbrella runner, W. C. B. Sparry.	27,77
_		

#### TRADE MARKS.

ı	Bath tubs. Standard Manufacturing Company	30.780
ı	Bath tubs, Standard Manufacturing Company	
ı	Beer and malt extract, lager, A. G. Hupfel	30.738
ı	Boon lagen I clay Browing Company	30,737
ı	Beer, lager, Leisy Brewing Company	30,131
ı	Beverages, mixture of comminuted ingredients	
i		
ı	for use in the making of, C. F. Blanke Tea and	
ı	Coffee Company	30,740
ı	Doiles makes someound for precipitating mineral	00,
ı	Boiler water, compound for precipitating mineral	
ı	substances contained in, T. E. Breyer	30,773
ı	substances contained in, 1. E. Diejei	00,110
ı	Boilers for steam and water heating systems, Ke-	
ı	wannee Roiler Company 30 775 to	30 777
ı	wau nee Boner Company	00,111
ı	wau nee Boiler Company30,775 to Box nailing machines, W. S. Doig	30,779
ı	Burial caskets, Detroit Casket Company	30.781
ı	Durial Casacts, Detroit Casact Company	
ı	Cathartics, W. C. Shields	30.747
ı	Cement, Portland, Hammer Society	30,769
ı		
į	Cigars, Rosenstein, Cohn Cigar Company	30,734
i	Cigars and all tobacco cigarettes. E. Seidenberg.	
ı	cigais and an tobacco cigarettes, E. Beidenberg,	
ı	Stiefel & Company	30,735
ı	Collars turn down Earl & Wilson	30,731
ı	Conars, turn down, Darrie Wilson	
ı	Corsets and parts thereof, Kops Brothers	30,732
ı	Dentifrice, F. A. Sarg's Sohn & Company, K. K.	
ı	Dentifice, I. M. Barg & Boun & Company, R. R.	
ı	Landespriv. Milly, Kerzen, Seifen, und Gly-	
ı	carin Fahrik	30,758
ı	Celli Fabilia	50,150
ı	cerin Fabrik	
ı	907	30,745
ı	sey	
ı	Frour, wheat, moseley & motley milling Company	30,744
ı	Food for infants, invalids, and dyspeptics, pre-	
ı	100d 101 Interest, Inventor, and dyspersion, pro	00 740
ı	pared, T. W. Hobron	30,742
ı	Food for infants invalids and dyspentics pre-	
١	Total A D E Waters, that dyspepties, pre-	20 742
ı	pared, A. P. F. Kufeke	30,743
ı	Gas mantles, incandescent, Adams Nomatch Light	
ı		20 505
ı	Company	30,767
1	Hair restoratives, M. E. Tucker	30,757
ı	Homoga desgrings oils for losther goods black	00,101
1	Harness dressings, oils for leather goods, black-	
۱	ing, leather grease, and other dressings, F.	
1		20 771
1	Tanner & Company	30,771
1	Heaters, water and steam, Kewaunee Boiler Com-	
1		30,778
1	pany	00,118
1	Lamp chimneys, Peerless Lead Glass Works	30,768
1	Malt artract Tannassaa Brawing Company	20 730

Mait extract, Tennessee Brewing Company.

Matches, Friction, National Safety Match Company.

Matches, Friction, National Safety Match Company.

Mechanical and surgical instruments and appliances, J. Pfeiffer.

Medicine Soft Pfeiffer.

Medicine preparation for strengthening the blood, G. E. B. & C. Smith.

Medicine for preparations and soaps, certain named, B. B. & C. Smith.

Medicine for purifying the blood, W. H. Walz.

Medicine for purifying the blood, W. H. Walz.

Medicine for the treatment of bacteriological diseases, J. R. Witzel.

Oils, lubricants, varnishes, enamels, and pigments or paints, M. H. Goold.

Packing materials for joining steam, water, and gas pipes, Firm of Ing. C. Carloni.

Matches, Firm of Ing. C. Carloni.

Morris Paper, follet, Clark-Sawyer Company.

Morris Morris Paper, follet, Clark-Sawyer Company.

Morris Morris Morris Paper, follet, Clark-Sawyer Company.

Morris Mo Malt extract, Tennessee Brewing Company......
Matches, friction, National Safety Match Com-

#### PRINTS.

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print is used since 18%, will be furnished from this office for 10 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York. Special rates will be given where a large number of copies are desired at one time.

Canadian parents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at cost of \$40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 351 Broadway, New York. Other foreign patents may also be obtained.



DRY BATTERIES.—A PAPER BY L. K. Bohm, treating of open circuit batteries, historical dry batteries, modern dry batteries, Hellesen's battery, Bryan's battery, Koller's battery, and the efficiency of dry cells. With three lilustrations. Contained in Scientific American Supplement, No 1001. Price 10 cents. To be had at this office and from all newsdealers.

The model will be mailed postpaid for 10 cents Book of information about painting, "How to Increase the Size of Your House with Paint," and a Master Painters

Experimental & Model Work

JAS. E. PATTON CO., Milwaukee, Wis., U.S.A.

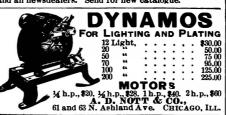
9 JAS. E. PATTON CO., MILWAUKEE, WIS., U.S.A. &

#### nd advice free. Gardam & Son, 45-51 Rose St., N. Y



KNAPP'S LITTLE DOCTOR Invaluable as a curative agent for nervous and other ailments. Current graduated as required. Every boy should have one for electrical experiments and amusement. Put up in neat cabinet with full instructions for use. Price complete, \$1.50 (by mail 30 cents additional). Send stamp for circular of other novelties. KNAPP ELECTRIC & NOVELTY CO., 45 WARREN ST., N. Y.

PERPETUAL MOTION.—A VALUABLE series of papers giving all the classic forms of perpetual motion apparatus. The literature on this subject is so very limited, the only book being entirely out of print, so that this series will be important to all inventors. 30 illustrations. SIGENTIFIC AMERICAN SUPPLEMENT, Nos. 1130. 1131, 1133. 1135. 1136. 1137. 1136. Price, 10 cents each. For sale by Munn & Co. and all newsdealers. Send for new catalogue.



\$45 Plating Dynamo for 50 gallons Nickel Solution. Dynamos for light and Electric Motors for power. All sizes, best construction and sold on easy payments. State what you want. The Hobart Electric Manufacturing Co. Troy, Ohio.



A New Static and Large COIL X RAY TUBE Highest effic-Send for illus. catalogue of X Ray Supplies.

Kirmayer & Oelling, 17 Bromfield St., Boston, Mass.

THE CARBIDES AND ACETYLENE Commercially Considered.—By T. L. Willson and J. J. Suckert, Ph.D. A consideration of the carbides and acetylene from a commercial point of view, preceded by a brief history of these compounds, the methods of their formation, and their chemical and physical properties. With 10 illustrations, Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 1015 and 1016. Price 10 cents each. To be had at this office and from all newsdealers.

#### IF YOU WANT TO LAUGH, THE DONKEY PUZZLE send 10 Cents for the DONKEY PUZZLE

CHAFFEE & SELCHOW, sturers of GAMES, TOYS, NOVELTIES, etc. 451-455 W. 125th St., New York City.

## Che Book of the Royal Blue

The "Book of the Royal Blue," issued by the Passenger Department of the Baltimore and Ohio R. R., has made its initial appearance with the October number, and is, undoubtedly, the most creditable magazine of its nature published. Aside from being a model example of modern typography, it is most interesting as to its contents. A field for interesting literature is certainly offered by the Baltimore and Ohio R. R., because it is the oldest railway in the United States; is foremost in historical prominence and is rich in magnificent scenery. The latter especially affords an endless scope for illustrations, and the magazine has started on its venture with all these points full in

Copies can be obtained by enclosing four (4) cents in stamps to the Advertising Department, Baltimore and Obio R. R., Baltimore, Md.

## SPECTACLES { F. E. BAILEY sells spex cheap. Write for new optical catalogue. 271 Wabash Ave., Chicago.

Wanted to Manufacture Small Metal Articles. Press work a specialty. Nickel plating and enameling. Correspondence solicited. J. J. Walsh Mfg. Co., Yonkers, N.Y.

### FILMS & MACHINES

\$15 course in mech. drawing at Rockton Corresp School of Mech. Engineer'g, Little Falls, N. Y. B. 703, will make you a proficient draughtsman

MACHINES, Corliss Engines, Brewers' and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton Street, Milwaukee, Wis.

ELECTRICAL Bicycle, and Photo. Novelties, low prices, 100 page cat. FREE L. E. S. CO., 32 Cortlandt St., N. X

Idens Perfected and J. C. SEYI., 181 Madison St., Chicago. MODELS done on short notice. Cata-logue Free.

## OUVIE I THU INC W my agents to sell from ouse to house. Chas. Lubrecht, P. O. Box 2514, N. Y.

HAMBURG FIRM

first class American and European references, wishes t represent first class American houses. One party is nov in New York. Address 140 Fifth Avenue Hotel, N. Y.



YOUNG MARRIED MAN, with considerable eans, wishes to associate himself with a Machine or means, wisnes to associate nimsell with a machine of Manufacturing Concern, where he can apply his finan-cial and office ability. State particulars and number of men employed. Addr. German-American, Box 773, N.Y.

WOOD WORKERS



W. E. CALDWELL CO., 217 E. Main Street, Louisville, Ky.

ARMATURE WINDING, RIGHT AND Left Handed.—An important paper for all amateurs. 17 illustrations. SCIENTIFIC AMERICAN SUPPLEMENT, No. 1139, price 10 cents. For sale by Munn & Co. and all newsdealers. Send for 1897 catalor ue.



## DES MOINES INCUBATOR CO., Box 75 DES MOINES, IA-Flow to Become a

Successful Electrician

By Prof. T. O'CONOR SLOANE. 189 Pages, Illustrated, \$1.00.

T is the ambition of thousands of young and old to become electrical engineers. Not every one is prepared to spend several thousand dollars upon a college course, even if the three or four years requisite are at their disposal. It is possible to become an electrical



engineer without this sacrifice, and this work is designed to tell "How to Become a Successful Electrician," without the outlay usually spent in acquiring the profession.

We can also furnish Prof. Sloane's works on electricity as follows:

Arithmetic of Electricity, 138 pages .... \$1.00 pages 3.00
Electricity Simplified, 158 pages 1.00

The above five volumes, comprising a COMPLETE ELECTRICAL LIBRARY, sold at the special reduced price of \$5.00 put up in a neat folding box. You save \$2.00 by ordering the set complete.

Five volumes 1,300 pages, over 450 illustrations.

Send for special circular containing full table of contents of the above books. MUNN & CO., 361 Broadway, New York.

OUR 1898 CHAMPION BICYCLE HUBS. .

Bearings are correct shape to give true rotation to balls without slip. Coues are warranted tool steel, thoroughly hardened, ground, and polished dead true. 13F Send for Circular. I. A. WESTON CO., Syracuse, N. Y., Manufacturers of Cycle Wheels, Sulky Wheels, Carriage Wheels, Crank Hangers, Bicycle Hube, Spokee, Nipples, Rims, Balls, etc.



#### Mdvertisements.

ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line Back Page, each insertion. - \$1.00 a line TF For some classes of Advertisements, Special and Higher rates are required.

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 the following week's issue.



## Every Point a Good Point

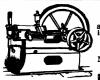
in the NEW MODELS of the



#### STANDARD TYPEWRITER

Good in every part — good for every purpose. Does good work, and does it a good long time. ::: ::: ::: :::

WYCKOFF, SEAMANS & BENEDICT 327 BROADWAY, NEW YORK



#### Greameries are using with great sat-isfaction and economy

THE CHARTER.

No Fire! No Coal! No Smoke! No Danger! No Dirt! Send for Testimonials to

Charter Gas Engine Co. STERLING, ILL.



## The Van Norman

Universal Bench Lathe.



A Lathe, Milling Machine, Screw Cutter and Universal Grinder in one tool. The best tool made for all kinds of small work. Made by Waltham Watch Tool Co.

SPRINGFIELD, MASS.

Send for Catalogue.

PRIMITIVE TRANSPORTATION .-- BY Prof. Otis T. Mason. An elaborate study of the methods of transportation among primitive and savage peoples. A very entertaining article. 18 illustrations. SCIENTIFIC AMERICAN SUPPLEMENT, No. 1138, price 10 cents. Forsale by Munn & Co. and all newsdealers.

#### IMPERIAL BALL BEARING AXLE



PATTERN.

Yours truly,

Endorsed by the Leading Carriage Builders. TO RIDE EASY, GET RUBBER TIRES.
The Kelley, Maus & Co. Tire is the best on the market.

\*EF Write for Descriptive Catalogue.\*

KELLEY, MAUS & CO., Imperial Ball Bearing Axle and Vehicle Rubber Tire Dept., 439 Wabash Av., Chicago.

## .50% Carbon Pioneer Brand Steel Tube'

Every Bicycle Manufacturer should use it. Every Dealer should insist on having it. Every Rider should demand it.





While WEIGHT FOR WEIGHT in a Bicycle our FIFTY CARBON Steel will last so long

NOTE THE FULL IMPORT OF THE PARALLEL LINES.

The comparison which they graphically make indicates the result of the prolonged investigations of the most practical experts of the world.

That the tests in our own laboratory corroborate these results is merely so much to its credit; that the same is true of actual trial on the road equally proves the trial to have been made in bicycles of correct design and construction. THE FACT REMAINS UNDISPUTED.

The Margin of Safety is Greatly Increased by the Use of This Tube. Send for Catalogue. THE POPE TUBE CO., HARTFORD, CONN.



How to make money with a Magic Lantern or Stereopticon is explained in 260-page catalog describing apparatus & Vinco McALLISTER, Mg. Optician, 49 Nasau St., N.Y.

THOROUGH INSPECTIONS

INSURANCE

DAMAGE PROPERTY LOSS-OF-LIFE

## Buy Telephones

THAT ARE GOOD--NOT "CHEAP THINGS." That are GOUD-ROT CHEAP HINGS. The difference in cost is little. We guarantee our apparatus and guarantee our customers against loss by patent suits. Our guarantee and instruments are both good. VESTERN TELEPHONE CONSTRUCTION CO. 250-254 South Clinton St., Chicago. Largest Manufacturers of Telephones exclusively in the United States.

#### Tools For All Trades



You can't even think of a Tool that isn't mentioned in our 1877 Tool Catalogue. Every Metal Worker, every person interested in Machinery or Machinery Supplies, needs it in his business. It contains 710 pages, 10% x71% inches, and is a complete Tool Encyclopedia. Handsomely bound in cloth, express paid on receipt of \$1.00. Money paid for book will be refunded with first order amounting to \$10.00 or over.

MONTGOMERY & CO FINE TOOLS 105 Fulton Street, New York City.

At 4 Price Bicycles, Watches Guns, Buggies Harness, Sewing Machines Organs, Plance Safes, Tools Scales of all varieties and 1000 other articles Lists free Carcaso Scale Xo., Chrospo Ili.



The most handsome, neatest, quickest and most easily acquired ornamental lettering. Based on mathematical principles, anybody can learn it in a few hours from the Methodical Textbook to Round Writing, complete with an assortment of 25 single and double pointed pens, postpaid, \$1.10. The most practical system of lettering for maps, plans, book headings, insurance policies, diplomas, legal documents, price tickets, etc. KEUFFEL & ESSER CO., 44 Ann Street, NEW YORK.

## The Typewriter Exchange



1⅓ Barclay St., NEW YORK 156 Adams St., CHICAGO 38 Court Square, BOSTON

818 Wyandotte St., KANSAS CITY, MO. We will save you from 10 to 50% on Typewri-ters of all makes. Send for Catalogu

## The Real Value

of a watch depends upon the accuracy of the movement and not upon the price of the case. The "RIVERSIDE"

Waltham Watch movement is a most accurate time=keeper.

For sale by all retail jewelers.



Tested and True.



The Easiest Running Wheel in the World. Send for Catalogue.

#### 

HALF A CENTURY OF CYCLES.—AN interesting history of the cycle from its origin up to the present time. The first crank-driven bicycle. The "bone-shaker" and its successors. The tricycle. The modern wheel. Cycle building a science. Points of improvement. The pneumatic tire. A hand and foot cycle. With 9 illustrations. Contained in Scientific American Supplement. To be had at this office and from all newsdealers.



# Feature

and an interesting and valuable one-the publication every week of "Selected Formulae,"

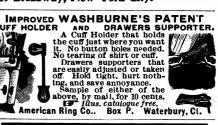
## Scientific American Supplement.

This matter is carefully selected and is taken from various authentic sources-from the standard authorities of the whole world-and is peculiarly interesting to

#### CHEMISTS AND PHYSICISTS

who find them of great value in their studies and eriments. One many times the subscription price of the paper \$5.00 a year. Address

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



NTI-RUSTINE Prevents Russ on Machinery and Tools. GOLDING & CO. BOSTON, MASS.

PRINTING INKS The SCIENTIFIC AMERICAN is printed with CHASENEU JOHNSON & CO.'S INK, I'enth and Lombar Sts., Philadelphia, and 47 Rose St. opp. Duane, New Yor

## COVANDINSURANCE INJURY TO-PERSONS CAUSED-BY STEAMBOILER-EXPLOSIONS Marvel in Machinery

for speed, precision, neat ness and smoothness of

RIVETT LATHE with Cutter Milling and Gear Cutting Attachment. Now in use in all the best shops and adopted by all great universities.

## FANEUIL WATCH TOOL CO., Boston, Mass., U. S. A. THE BICYCLE: ITS INFLUENCE IN

Health and Disease.—By G. M. Hammond, M.D. A valuable and interesting paper in which the subject is exhaustively treated from the following standpoints: 1. The use of the cycle by persons in health. 2. The use of the cycle by persons diseased. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1002. Price 10 cents. To be had at this office and from all newsdealers.

## THE AMERICAN CEMENT CO. SAYS:

"We have been using the Griffin Mill for seven years, and now have

clinker of extreme hardness and tenacity, and in the matter of quantity of material produced per hour, in the matter of fineness of cement ground, and in the matter of economy, we find them far superior to any other mill."

Egypt, Pa. John W. Eckert, Superintendent. R. W. Lesley, Treasurer. We will be glad to send any Cement Maker our pamphlet giving full information regarding the Griffin Mill, and letters from others of the leading Cement Grinders of Europe and America.

AMERICAN CEMENT CO.

BRADLEY PULVERIZER CO., 92 State St., Boston.