a WeEkly Journal of practical information. art, science, mechanics. Chemistiy, and manufactures.



COMPREmAD AIR TRACTION IN NEW YORE CITY-1.000 HORSE POWER COMPRESSING ENGINE.-[See page 184.]

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ESTABLISHED 1845
munn \& co., - - - Editors and Proprietors.
published weekly at
No. 36I BROADWAY, - - NEW YORK.
terms to subscribers
 the scientific american publications.


MUNN \& Co., 36i broadway, corner Franklin Street, New Yo
NEW YORK, SATURDAY, SEPTEMBER 16, 1899.

## RAPID TRANSIT BY THE GRACE OF THE

 POLITICIANS.At last it begins to look as though New York city were to be provided with its rapid transit system, so sorely needed and so earnestly advocated by what is practically the entire voice of the press and the people. At recurring intervals in the past when everything has seemed ripe for the commencement of the work, the whole scheme has been discredited, cloaked, and spirited away from public view by one of those many dexterous, slight-of-hand performances whose secrets are known only to those within the innermost circle of municipal politics. For the past few months the ques tion of New York rapid transit has been so utterly dead that it seems to have passed entirely from the public mind ; yet suddenly, without any preliminary warning, the scheme is brought out again with much blare of trumpets and promise of speedy performance
Amid all the rapid transit discussion that has been aroused, one looks in vain for a single new argument in its favor, or a solitary reason why it should be greater necessity to day than it was last year or in any of the long years that have passed since the question was first mooted. This most important municipal ques tion has formed the subject of numerous articles in the Scientific American, which in common with the technical and general press of this city has pointed out the necessity for the system and the entire feasibility of the plans drawn up by the engineers of the Rapid Transit Commission. As a matter of fact, the argament were long ago made, and to repeat them is to tire one's readers with wearisome reiteration. This great city needs rapid transit; it has asked for it ; its engineers have laid out a feasible plan; it is rich enough to pay for tt and there is not the faintest question as to its being at least self supporting, and yet with all these facts in its favor, the greatest municipal problem of the leading city in the new world is being made the sport of a few political adventurers, who seem to have the power to promote or delay it without the least regard for the urgent needs and expressed wishes of the citizens.

## OUR FASTEST BATTLESHIP.

It is with great satisfaction that the Scientific American turns from the subject of our proposed slow-going cruisers to record the excellent speed that is being shown by our latest battleships. Last week we drew attention to the fact that the "Alabama" in a preliminary builders' trial had made an average speed of 16.3 knots over a 23 -mile course, a maximum speed of 17.2 knots having been made with the wind and tide, and a speed of 15.43 knots against them. On this occasion the "Alabama" did not carry any of her guns, and a large amount of her armor had not yet been bolted on, so that she was probably from 1,500 to 2,000 tons short of her trial displacement of 11,525 tons. At the same time she was undoubtedly very foul as the result of being afloat for over a year at the Cramps' shipyard. It is reasonable to expect that on her official trial, with a clean bottom and under the favorable conditions of the best of coal and expert stokers, she will be capable of repeating the performance in spite of her greater displacement.
The good showing of the "Alabama," however, has been eclipsed by that of the "Kearsarge," one of the pair of fine battleships that is nearing completion at the yards of the Newport News Shipbuilding Company. This vessel has also been afloat for over a year, the date of her last visit to drydock being August 8, 1898, and on the occasion of her informal trial she cariled the whole of her armor, together with the heavy guns of the 13 -inch and 8 -inch batteries, the only weights not carried being those of the 5 -inch guns of the intermediate battery. Hence her displacement and draught were only slightly below what they will be at her official trial. Under these conditions the ship made by log during half an hour's steaming under forced draught a speed of 17.25 knots an hour.
The trial was made in water whose depth varied between ten and twelve fathoms, and it is a well understood fact (though only discovered a few years ago in
the trials of some high speed cruisers) that a difference of fifteen or twenty fathoms in the depth of water the speed of a din sonable to expect that when the "Kearsarge" is put in trial trip shape, she will be capable of maintaining an 18 -knot averare over the deep-sea trial course. If she does this, our latest first-class battleship will easily be our fastest, the "Iowa" coming next with a trial speed of 1708 knots per hour.

WORK OF THE INDUSTRIAL COMMISSION
The Industrial Commission, which commenced its autumn session on the 5 th of this month, in Washington, is equally deserving of the title " lndustrious Commission," it would seem. Having divided itself into various sub-committees, its work of gathering information of vital import has gone on continuously during the heated term, while the whole force of special stenographers attached to the commission have been equal ly busy preparing the testimony, thus taken, for the government printers. This will make a report, soon to be issued, of incalculable value in all matters concerning the industrial condition of this country. One of the first witnesses of chief magnitude to appear early at this session will be John D. Rockefeller who it is not unnaturally believed, is the possessor of much knowledge likely to be valuable to the commission. It is now proposed that the commission will visit ChiIt is now proposed that the commission will visit Chi-
cago, late in September, to investigate the so-called cago, late in September, to investigate the so-called
"Grain Elevator Trust" of the West. This is one of "Grain Elevator Trust" of the West. This is one of
the trusts believed by many to be beneficial and a necessity if a foreign market for American cereals is to be maintained against Russian and South American inroads. As many, with socialistic tendencies, on the other hand, believe such maintenance of American supremacy should be furthered by federal bureaus and that the trust is, in fact, a detriment to the Western farmer, it is thought that the commission here enters upon one of its most vital lines of inquiry.

## TRADE WITH OUR NEWLY ACQUIRED TERRITORIES

The Bureau of Statistics of the Treasury Depart ment at Washington has just given out a resume of the export and import figures of the trade between this country and our newly acquired territories or temporary dependencies that is both interesting and encouraging to the friends of American commerce Even in the reciprocity years of 1892 to 1894, in which the exports from this country in those directions were greatly increased, the totals were not as large as those of the recently ended fiscal year, with all its disall vantages of active warfare. To Puerto Rico our ex ports are nearly 25 per cent in excess of the average of the past decade : to Cuba they are nearly 50 per cent greater; to the Hawaiian Islands over twice as great and to the Philippines more than three times as much. The exports to these islands made necessary by the support of our military establishments and by the considerable shipments in aid of the temporarily destitute are not included in these figures; they are only those of the legitimate increase of commerce. Naturally, as a result of war, and especially so in Cuba and the Philippines, the imports from these lands to us fell off very considerably during 1898; but the healthy re sumption of trade relations is shown by a small in crease as compared with last year in Hawail; nearly 20 per cent in the Philippines; almost 59 per cent in Puerto Rico; and over 66 per cent in Cuba. These are most gratifying trade reports.

## THE "SHAMROCK" AND HER CHANCES.

When the "Shamrock" poked her long nose through the early morning mists off Sandy Hook at the close of her fourteen-day trip across the ocean, it was found that if she embodied any striking novelties of construction they must be hidden away below the waterline or beneath the shelter of her canvas-covered aluminum deck. In her sail plan she is the typical English cut ter, with such variations as always characterize the boats of Fife, her talented designer. The most not able features of the hull, or that part of it that can be seen, are the exceptionally high freeboard (between 5 and 6 feet) and the great beam of the boat at the quarters. The advantage of these features was evident in her preliminary trials off Sandy Hook, when she reached in a fresh breeze from Sandy Hook Lightship to the Scotland Lightship, a distance of $4 \frac{1}{8}$ miles, in 19 minutes and 10 seconds-a speed of 13 knots-withou putting her lee rail below the water. Like the "Vigi lant," she appears to be at her best when sailing "on her uppers." On the same day, when close-hauled and sailing within four points of the wind, she made by log a speed of just under 11 knots an hour, and before the wind her speed by log was a trifle over 12 knots
Now, in judging of these performances, which may be taken as reliable, it must be borne in mind that the yacht was not carrying her racing canvas, that he bottom has not been cleaned for nearly two months, and that she gave the experts who were watching her the impression of having a considerable reserve of power, even at the high speeds of twelve and thirteen
knots. The preliminary trials establish the fact be yond question that in "Shamrock" we have to meet a ene other hand, th visitor failed to make such a good impression, and seemed to lack that ability to slip a way at the first suggestion of a breeze which is such a conspicuous fea ture in "Columbia." This may be accounted for in part by the possible foulness of her bottom, which, while it would not greatly affect her speed in a fresh breeze, would retard her greatly at slower speeds, where wave-making ceases and skin-friction becomes the chief element of resistance. But though the larger sailspread which she is to carry will also in crease her light weather speed, the present indications strengthen our impressions, formed from her races with "Britannia," that "Shamrock" is not by any means a light weather boat.
Curiously enough the conditions appear to be reversed, if anything, in "Columbia," for while she is practically held by "Defender" in a fresh breeze, she begins to walk away from the older boat with an excess of speed which steadily increases with the lightening of the wind.
The present indications are that on days when the winds are light or of moderate strength "Columbia" will win by a comfortable margin; while on days when the winds are fresh to strong the "Shamrock" may be the first to finish, particularly over a triangular course. We base this conclusion on the facts that in crossing the Atlantic under reduced rig, the "Shamrock" on one occasion covered 288 miles under her own sail in the twenty-four hours in a rough sea. This is an average speed of twelve knots an hour, and the performance certainly suggests that in the smoother seas off Sandy Hook, with a clean bottom and racing canvas aloft, and in a wholesail breeze, she could reach around a triangular course at a speed of 13 to $131 / 2$ knots an hour.
But we must remember, on the other hand, that the very features which enable the boat to "carry on" in a blow will hold down her speed in light airs; and the experience of the past decade on the Sandy Hook courses proves that on five days out of seven in October the winds will probably be light. Hence it looks as though the cup were likely to stay on this side of the water for at least another twelve months.

## ARTIFICIAL SILK.

The production of artificial silk has for some time past attracted the attention of experimenters in France, and it has been used with success to replace natural silk in certain fabrics. The Count du Chardonnet, who claims to be the first to have successfully carried out the process, exhibited some fine specimens of artificial silk at the Paris Exposition of 1889. Since then he has perfected his system, and at the present time a factory of considerable importance is in operation at Besançon, under the direction of M. Tricano. This factory is now capable of producing 150 kilogrammes of artificial silk per day.
Natural silk is largely made up of a body called "fibröin," together with other substances such as gelatin, albumen, wax, coloring matter, fatty and resinous matter, etc., the cellulose of the mulberry leaf being thus transformed by the silkworm. The nature of these transformations is of course unknown, and in order to produce a substance resembling silk, a method is adopted by which the cellulose furnished by cotton is used as a base. The cotton, having been transformed into nitro-cellulose, or guncotton, by treating it with nitric and sulphuric acids, this latter is dis solved in a mixture of ether and alcohol, and the resulting collodion is filtered under pressure
In order to be successfully used for the production of artificial silk, it is found that the collodion must be allowed to "age" for a certain period of time, the reason of which has not been definitely settled : how ever, it is certain that the collodion, on being allowed to stand, undergoes certain modifications by which it is better fitted for the purpose. It is then run into cylinders, which have capillary holes in the bottom, and the collodion is forced out of these holes under a pressure of forty to fifty atmospheres. It comes out in the form of white cylindrical filaments; these are united to form threads. which are put up in skeins and all traces of alcohol or water which they may contain are removed. In this state, however, the threads are extremely inflammable, partaking of the nature of guncotton, and to re move this difficulty they must, be "de-nitrated," that is to say, the cellulose must be brought back into its normal condition. This part of the process, which is indeed an essential one, involves considerable difficulty and has been experimented upon for some time by M. du Chardonnet and others. However, a process has at last been arrived at which accomplishes this in a satisfactory manner. The details of this process have not as yet been made public: but it is certain that by thi operation white silky threads are produced, which are not appreciably more inflammable than natural silk The skeins which have been made up of these threads are then dyed by immersing them in a heated bath of basic aniline color.

September 16, 1899.
Stixntifut Ameritan.

## LIQUID AIR AS AN EXPLOSIVE.

In a recent number of the Scientific American SUPPLEMENT, there appeared an article by we in which the claims of liquid air to employment in the explosive world were examined, with the conclusion that it had little to recommend it. It was pointed out that its theoretical value lay in the fact of its affording a source of highly condensed oxygen, and that, on ac count of the lower boiling point of nitrogen, liquid air could be profitably concentrated to a point where the percentage of oxygen ran from 50 to 75 per cent. The mixture of this oxygenated fluid with a proper com bustible gives a powerful and simple explosive capable of detonation. It was further pointed out that the volatility of the liquid precluded its use in all but the large contracts where a liquefying machine could be installed as part of the contractor's plant. Even here, the practice generally accepted in blasting work as conducive to economical results, that of firing a large number of holes at once, put it out of consideration, since a delay in firing at once a hole, after charging with a liquid air explosive, entailed an amount of evaporation that was fatal. How this limitation entered into the problem was illustrated by the unsuccessful trial of the system at a coal mine in Europe where prepared cartridges standing fifteen minutes where prepared cartridges standing fifteen
lost all or nearly all of their explosive power.
This oxygenated fluid is receiving another trial in Europe under conditions meeting its limitations as far as possible. The facts have been communicated to me by an eminent expert on explosives who has recently returned frow Europe. and will be undoubtedly of much interest to the readers of this paper. Work is progressing simultaneously at both ends of a tunne that is being put through the Alps. On the southern side the usual explosives for hard rock, blasting gelatine and gelatine dynamite, are being used. On the northern side liquid air is being tried with conces sions to its characteristics that afford it every chanc of demonstrating any value it may have. In the first place, one hole, or a few at the utmost, are charged and fired at a time. This reduces the time in which the ozygen has a chance to evaporate, the method of charg ing a hole being in addition very simple and rapid. A cartridge containing the combustible element in a form permitting rapid absorption of the liquid is slipped into the hole, the oxygenated liquid poured into the cartridge, a cap with fuse put in, a light tamp in serted, and everything is ready for lighting the fuse However, the firing of single holes means increased expense in the item of total idle time of the men during the explosions for a given amount of work. In the second place-and the most important side of the matterwuch larger boreholes are being employed than are found advantageous with the nitroglycerine explosives.
The problem in blasting work is generally to dislo cate, per pound of explosive, the greatest possible amount of rock in fragments convenient for handling and removal. If the blasted material is to be used spe cifically for any purpose, blasting conditions must be varied to give it in the desired sizes. Now, the charac ter of the material determines the explosive to be used. In earth work the dynamites are outclassed by black powder, which develops its pressure comparatively gradually and dislocates or disturbs a large amoun of earth, while the sharp action of the dynamites leads to compression of the material around the charge and strong wave movements in the total mass, but gives little useful work. In rock of any degree of hardness the reverse is true
Here the black powder calls for tamping of fissures and boreholes to the extent that they are not the .weakest points. The rock is removed in large masses, . weakest points. The rock is removed in large masses,
needing further breaking up. The dynamites do not needing further breaking up. The dynamites do not
require such heavy tamping, since they detonate and require such heavy tamping, since they detonate and
tend to crush the rock into small fragments. In the range from the soft to the hardest rocks there arises a similar need for variation in the action of dynamites, which is met by the adiuixture in various proportions of nitroglycerine with inert bodies, combustibles, or oxygen-bearing salts, alone or together. Such admix ture not only changes the force but varies the sharp ness of the explosive blow. The softer the material in which work is being conducted, the greater the need which work is being conducted, the greater the need
of an explosive giving a pushing rather than an imof an explosive giving a pushing rather than an im-
pulsive shock. An apparently strange fact is that wet guncotton has a greater shattering effect than dry guncotton. Though wet guncotton has the lower explosive force, the detonative wave is propagated more rapidly in it, giving a sharper and consequently more destructive blow. This will illustrate why the various grades of dynamite have different effects. So it may be that liquid air explosives combine power and degree of sharpness of detonation in such a manner as to be well adapted to the hard rock met in this tunnel. The explosive emploved should certainly have as
high a strength as the gelatine dynamites. Being high a strength as the gelatine dynamites. Being a mechanical mixture of combustible material, it would seem that it should not detonate as sharply as the gelatine dynamites. These conditions would seem to indicate that the borehole could be economically
enlarged. But the results of long experience must settle the watter, especially the question as to what extent can a supposed decrease of blasting expenses under can a supposed decrease of blasting expenses under favorable conditions counterbalance the many disad
vantages involved in such a volatile explosive mixture It is apparent that operations must run very smoothly and everything held subordinate to exploding the charges as soon after the holes are ready as is possible Now, delays must occur, and a weakened charge may produce undesirable effects, such as enlarging the borehole.

A Linde machine is made use of. Another point: of interest is that a heavier cap than usual is required. However, the phase of the question upon which these experiments bear is not the value of liquid air for general blasting work, but its value for certain classes of work under special conditions. The parties from whom the information came originally claimed success, but, as they were interested in the matter the statement must be taken with the usual grain of salt. The history of explosives is full of wonderful compounds that perished prematurely through a thorough trial. I have in mind a non-freezing dyna mite that was going to revolutionize things a few years ago. It strangely blossomed in summer time, when it proved part of the claims made for it, that of strength. Naturally, since it was a powerful dynamite, the first frosts wilted it badly. In most pro fane language irate contractors began asking what kind of a non-freezing dynamite was one that froze quicker and more hard than their old friend, and in addition "busted" the cases and became very coy about exploding after being thawed out.

## SCIENTIFIC CONGRESS AT COLUMBUS.

Resuming my review of the American Association for the Advancement of Science meeting
Dr. Howard read a paper about "Gad Flies," in which he detailed the experiments of a Russian entomologist, who killed enormous numbers by means of a kerosene film spread over the pools in which they are known to breed. He claimed that previous to these experiments of Porchincki, he himself had tried a similar method for the destruction of mosquitoes, and had called attention, in 1892, to the fact that many gad flies were thus captured.

A wonderfully interesting commnnication concerning the blind fish, and other blind cave animals, was read in the section of Zoology, by Prof. Eigenmann, of the Indiana State University, of which it is hoped to give a more full account in a future number of this journal. The A. A. A. S. was so impressed by this able and learn ed paper as to appropriate the sum of one hundred dol lars to aid in Dr. Eigenmanu's further investigations into subterranean life, and its bearings on the theory of evolution by environment and compensation.
Dr. Washington Gladden, of Columbus, read a paper concerning the moral tendencies of the system of industry now prevailing, which he also reproduced in his own church the following Sunday. It showed that while we may never secure a perfect morality through improvement in the social mechanism, we may estab lish social conditions which shall be more friendly to morality than those that now exist. Prof. H. H. New comb, of Washington, D. C., discussed "Trusts," show ing their dangers and also exposing certain popular fallacies about them that actually hindered reform in the relations of capital and labor. He held that capitalistic combinations perform a useful public service : the field of legitimate inquiry being as to the proper distribution of their beneficial results. Such so-called "trusts" should tend to decrease prices to consumers, increase the demand for materials, augment wages, and ameliorate the condition of employes. Miss Florence Kelley, of Chicago; likewise read a paper bearing on the labor question, in which she narrated her per sonal experiences in trying to reform flagrant abuses in workshops, factories, and stores and her methods of securing the enforcement of salutary laws. The results appear to have been very beneficial. She is the daughter of Congressman Hon. Wm. Kelley, of Pennsylva

These are only a few of the two hundred and seventythree scientific papers discussed, and others might be regarded as equally worthy of mention. The more important addresses and papers will appear in the annual volume of the associational proceedings, while others will be given by abstract. Thus year by year a scientific library has grown up, whose contents have a value that can hardly be overstated, embodying, as they do, the history of learned researches in all departments for the last half century.

Evidently the visiting scientists and their hosts of Columbus were on the best of terms. Everything was done to make the forty-eighth meeting of the A. A. A S. memorable for hospitality as well as for scientific interchange of experience and discovery. Besides the more general entertainments, nearly every section and affiliated society had its supper, or trolley ride, or other excursion. Those who had never previously seen the
flames of the natural gas region were astonished and dazzled. Others rambled through the woods and fields for plants, or insects, or other specimens of natural history. The geologists took a day for the coal mines of Corning and Hollister, where they found mines worked by electricity and lighted by the same means, visited a subterranean forest of the Carboniferous Age, said to be the finest of its kind, and enjoyed the novelty of dining by electric light 200 feet underground and a mile from the daylight. These mines are owned by the Sunday Creek Coal Company and the Courtright Coal Company. The visitors noted with interest the beautiful plant impressions, the ferns, calamites, cordaites, and Sigillaria tessellata. There are 500 oil wells also in the Corning field, the oil being all derived from the Berea grit, at a depth of about 1,200 feet. The gas wells near Thurston are 2.000 feet deep and derive their gas from the Clinton-Medina formation.
A grand excursion was made at the close of the meeting to Sandusky, Kelley Island, and Fut-in Bay, at which place they explored the unique and marvelous Strontia Cave, the only one of the kind known. The arches are hung with prismatic crystals of "celestite." The place was found by Mr. Gustave Heinemann, in 1897, while opening a well. Besides exhibiting his grotto, he makes money by selling specimens of the sparkling strontia. Commercially this mineral is worth $\$ 12$ a ton, and is used to clarify beet sugar, and likewise in pyrotechnics, giving a vivid crimson color $t$, fire works.
An excursion to Macinac and the lakes was enjoyed by a number. An anthropological party visited Fort Ancient, an extraordinary prehistoric stronghold, located on the old Lebanon and Chillicothe turnpike, between Columbus and Cincinnati. It is my intention, however, to give a future article expressly on this extremely interesting and mysterious fortification.
Three cities contended for the distinction of entertaining the meeting in 1900, namely, Denver, Philadeltaining the meeting in 1900, namely, Denver, Philadel-
phia, and New York. The latter won the day. The phia, and New York. The latter won the day. The
date was set in June, from the 25 th to the 30 th, in date was set in June, from the 25th to the 30th, in order to favor members who may wish to attend the Paris Exposition. The president for 1900 is Prof. R. S. Woodward, of Columbia University, an alumnus of the Michigan University, distinguished for his services in astronomy, geodesy, and mathematics. He has for many years been the treasurer of the A. A. A. S., and is the president of the American Mathematical Society, and also a fellow of the National Academy of Sciences. and also a fellow of the National Academy of Sciences. A pleasant incident of the closing meeting was the gift
of $\$ 1.000$ frow Mr. Emerson McMillin, of New York, of $\$ 1.000$ from Mr. Emerson McMillin, of New York,
but formerly of Columbus. This places him as the but formerly of Columbus. Th
fourth patron of the association.

## AUTOMOBILE NEWS.

Chief Croker, of the New York Fire Department, has decided to use a gasoline automobile for going to fires. He finds that the two horses which he keeps to take him to fires are unequal to the duty imposed upon them. The new carriage weighs about 400 pounds.
An automobile has made the ascent of Mount Wash ington, 6,300 feetabove the sea level, in two hours and ten minutes, the distance being ten miles. This in cluded delays in replenishing the water tank. The time was, however, about half that required by the teams that make the trips with carriages. The carriage was driven by F. O. Stanley, of Newton, Mass.
According to The Wheel, there are probably over a dozen French firms who have been able to cope with the enormous demands made upon them for automobile vehicles. They have accomplished this by layingr down costly plants equipped with American machine tools and attracting the best mechanics into their shops by paying them high wages. Each of these concerns is turning out motor carriages of the standard types by the score. They continue to work from set pat terns and are not disposed to change them. Others who possess fairly satisfactory vehicles cannot manufacture them on a commercial scale either because they lack sufficient means or. are unable to get a sufficient number of hands. As in this country, there is also another class of small makers; these are the men who are inventing and perfecting motor carriages, and who build one from time to time.

A recent consular report from Consul-General Goodnow gives an amusing view of Chinese character. He says that it is impossible to sell anything to Chinese which they have not seen. Automobiles are the point in question. They have never seen them, and they cannot imagine what they can be like. Naturally, the average Chinaman has seen so few new things that it is not easy for him to exert his imagination. Makers of automobiles will find that it is useless to attempt to sell carriages to Chinese or foreigners by means of de scriptions or catalogues. It is proposed that ambitious dealers make a present of an automobile to some well known person in Shanghai, making him promise to use it constantly and prominently, so that the Chinese may become accustomed to the startling innovation. The place is an ideal one for motor carriages, the roads are macadamized and the climate very fine.

JIG-FILE FOR FINISHING DIES.
The accompanying sketch was made by our artist The accompanying sketch was made by our artist
during a recent visit to the works of the American during a recent visit to the works of the American
Walthan watch factory. It represents one of the thousand-and-one handy and ingenious machines with which the factory is crowded. Everyone who has handled a file at the bench knows how difficult it is to file a surface that shall be perfectiy plane or exactly normal to some other surface. No hand is so steady or eve so true but inequalities or variation will occur. In the jig-file herewith shown the operator is finishing up some of the fine dies which are used in the factory. The file is carried in a vertically sliding head operated by a crank and connecting rod below. It projects above a plane cast iron table, upon which the die is

firmly held down. and at the same time brought up with suitable pressure against the file. The machine is driven by belt and pulley and requires no manipulation after it is once started, the workman being able to direct his whole attention to bringing the die to the required shape. The table is capable of being set and clamped at any desired angle according as the edges of the die are to be square or at an angle with its face.

## A LARGE OCTOPUS.

## by prof. c. f. holder.

One of the most disagreeable animals of the sea to handle or contemplate is the octopus. The tangle of arms, the snakelike movements, the strange flashes of color. the green glittering eyes, are all features that arouse a strong feeling of aversion on the part of the observer. I have had under observation several octopi at the Santa Catalina Aquarium and it has been interesting to note the characteristic features of the various individuals. In a small tank were confined three individuals having a radial spread of perhaps 18 inches. One affected a light yellow hue and was timid, sulking behind a rock. Another, of a dark reddish cast, was continually flourishing its tentacles, rising and falling on the side of the glass until an observer nicknamed it the "skirt dancer." A third was almost black, and was a vindictive fellow, ready at any time to make an attack. When I introduced iny hand into the tank, this octopus would as quick as a flash send out one long attenuated tentacle and coil about it, then if an advance was made it would suddenly release its hold upon the rock and quickly encompass my hand with its eight arms. pressing the round serrated disks into the flesh while a tremulous motion would be felt.

At the first attack of this kind the sensation was one of horror. The hideous creature flattened out, assimilating the color of the flesh to a marked degree and evidently endeavoring to smother the hand with its folds, as the tentacles were distended to their utmost limit. To hold the hand firm under such circumstances required some effort, and I confess when it was first attempted, with a Florida specimen, 1 beat a rapid and decided retreat; but in the latter case I waited to see if the animal's object was to bite, knowing that the bill of so small a specimen bill of so small a specimen could not make a serious wound. But the octopus
merely pressed its mouth merely pressed its mouth
on the back of my hand, apnarentlv trving to intimi-
date the supposed enemy. While fastened to the hand, it still held to the rock, and it was with difficulty released. When I remained quiet, the animal began to creep along like a huge spider, but at the first movement of my fingers it pounced upon my hand again, enveloping it in the eigitsnakelike arms. I finally twisted out of its grasp and seized it firmly by the body, when its rage became intense. Flushes of color passed over it in rapid succession ; now red, black, yellow, and when at the height of its anger it was mottled and splashed with black-a frightful creature. It made a desperate effort to escape, but when released ejected a cloud of ink, darting off rapidly under its cover
This octopus resented any intrusion and advanced to the attack at once. When a strange octopus was placed in the tank, although much larger, it came out of its corner without hesitation, eyed the rewcomer a moment, then in some incomprehensible way literally hurled itself at the enemy, and in a second the two were rolling over and over in a contest that was amazing to witness. The sixteen tentacles wound about each other with the rapidity of light, and both animals ejected the inky fluid from their siphons. They re sembled a ball of snakes rolling along and strikiug at each other more than anything else. A close examination of the writhing wass showed that the object apparently was to smother the opponent. Finally, the newcomer beat a retreat : it was badly wounded, and succumbed a few hours later.
The octopus is a favorite subject with popular wri ters on natural history, and many accounts have been written of its ferocity, which are almost invariably denied by naturalists: yet I am inclined to think that in some instances certain individuals are more or less pugnacious. I have handled scores of them from the Gulf of Mexico and California, and observed only one instance-the one cited-where the animal deliberately rushed to the attack, though I know of two others. One was observed by Mr. Ralph Arnold, a geologist, of Pa sadena. He was wading among the pools at low tide at Point San Pedro when suddenly he heard a cry and turning saw some children in a pool, wading, and mov ing toward them a large octopus, its long arms raised ing the whe above the water. Whether the animal would have at rupted in a more or less violent manner. A resident of Washington told me that once when visiting the shore he was advised by the fisherman with him to avoid the pools, and when it beca:me necessary to cross them to pass over as quickly as possible, as large octopi fre quented them. He considered this the exaggeration of a fisherman, and paid but little attention to it; but once in crossing a pool, stepping from stone to stone suddenly a long livid arm shot out of the water and reached insinuatingly for his legs, the entire animal moving rapidly toward him. He, however, reached the rocks safely and bombarded the animal with stones. He estimated its size at twenty-five feet across, judging the tentacles to have been twelve feet in length Again, it cannot be determined from this whether the animal would have seized him : though the obstrver was confident that it would, and that it was large enough to have held him under water had he been pulled in.

The specimen shown in the accompanying illustra tion was taken near Avalon, Santa Catalina Island. Its arms were over 10 feet in length, giving the animal it radial spread of at least 20 feet. The strength of these large octopi was shown in this instance, it being almost impossible to hold the animal until a large rone had been thrown about it. In Alaska the octopus attains even a larger size, individuals having been re ported with a spread from tip to tip of tentacles of 25


OCTOPUS TAKEN NEAR AVALON, SANTA CATALINA ISLAND, CALIFORNIA
or 30 feet. Such an animal is represented in the Yale Museum by a cast, and gives an excellent idea of how the living animal looks. At Santa Catalina Island small specimens are very common, and one has been taken in deep water- 500 or 600 feet-having a radial spread of 15 feet, an uncanny monster, which, when it came up, threw its arms over the side of the boat and made a powerful resistance. Indeed, it was almost impossible to bring it in without tearing and cutting the large sucker-lined arms.
The octopus is a most interesting creature; its eight sucker-lined arms, like snakes, that creep into every nook, corner, and crevice ; its power of changing color, blushing and paling at the slightest alarm, being features that appeal to the fancy and imagination. The octopus has a small mouth with jaws which call to mind those of a parrot and powerful enough to enable them to sever the vertebrie of good-sized fishes which they may capture. Each sucker is a factor, and when it is remembered that there are scores of them, with sharp cutting edges, one can imagine the reserve force and power of the animal. When closely pressed, they resort to the ink bag and force a stream of ink out which permeates tlie water and in the shadow of which they escape. I have seen a squid hurl its ink a foot or more into the face of a boatman in Florida, who was peering into the water in search of them. The octopi in confinement, previously referred to, eat fish or crab meat, and upon securing it, spread out their webs, covering as much surface as possible, and when eating. the tentacles are nearly always in motion, "wriggling" being the only term to describe their peculiar motion.

A MECHANICALLY-OPERATED CROSS-CUT SAW.
A novel cross cut band or chain saw which is designed to saw logs far more rapidly and effectively than an ordinary saw has been patented by Matthew


## CLARK'S CHAIN CROSS.CUT SAW

J. Clark, of Chaparal, Arizona Territory. Of the accompanying illustrations, Fig. 1 is a perspective view of the saw in operation; Fig. 2 is a plan view of a link of the saw; and Fig. 3 is a side elevation of a link, with the one cutter removed. Fig. 4 is a sec tion of a link. The apparatus comprises a bar having at one end a head adapted to engage the log. At the other end the bar is threaded and formed with longitudinal grooves. $A$ box is mounted to slide upon the plain portion of the bar and has arms with opposite flanges extending within the grooves. A two-part nut, operated by a handwheel, is mounted to turn on the threaded end of the bar, between the flanges of the arms. In the box a shaft is journaled carrying a sprocket-wheel around which passes the chainsaw. The links of the chain, as shown in Figs. 2, 3 and 4, are provided at each side with cuttingwheels inclined to each other so that only the edges will engage the wood thus preventing the clogging of the wheels by the kerf. Chisels are connected with the links and extend between the inner faces of the wheels. The chisels are designed to de tach a layer of wood cut by the wheels. In operation, the head of the bar is driven into the log, the chainsaw is passed around the log and sprocket, and the box carrying the sprocket is shifted along the ioar by turning the
nut until the chain is taut. As the sawing progresses, the hand wheel is turned so as to screw the nut outwardly in order to force the sprocket-wheel toward the outer end of the bar. When the nut reaches the end of the threaded portion of the bar, a segment of the chain is removed; and the nut is returned to its initial position.

## IMPROVEMENTS IN ROTARY ENGINES

The many failures which have attended the efforts to produce a successful rotary engine and the fact that the direct acting crank and rod reciprocating engine remains in full possession of the field have led many people into the erroneous belief that there is something inherently wrong in the priuciple of the rotary en gine-that, like perpetua motion or the supposed self-multiplying powers self-id air, its theors of hiquid upo its theors based upon a of natural physical laws As a matter of fact however, the object aimed at in the rotary en gine are perfectly legiti mate, and the principles upon which inventors have been working ever since Ramelli, in 1588, designe Ramell, in 1588, designe his rotary pump, of whic the rotary engine is actuly sound.

The stumbling blocks which have brought rotary engine builders to grief have been entirely of a mechanical or structural na ture.

Undoubtedly the feature that has proved most at tractive in the rotary en gine is the fact that the pressure on the piston is at all points of the stroke applied tangentially to the circle described by the crank, and so avoids the "dead centers" of the reciprocating engine. The turning moment of any given amount of pressure at the crank pin upon the crank shaft is the product of this pressure by the vertical distance between the direction in which it is exerted and the axis of the crank shaft. In a reciprocating engine this vertical distance varies from zero on the dead centers to a maximum just before the half stroke, when the crank and connecting rod are at right angles. Consequently, a constant and even turning moment can only be secured in the reciprocating engine by connecting two cylinders to a common shaf and placing the cranks at ninety degrees. The piston pressure of a rotary engine, on the contrary, is always exerted tangentially to the circle described by the crank, and, consequently, its turning moment is at a maximum throughout the whole revolution.
There is, moreover, a loss of power in the reciprocat ing engine due to the change of direction of pressure at the cross-head, a certain component of the piston pres sure being exerted against the guide bars. This loss is greatest when the crank is near the half stroke and the turning moment is largest. Another alluring feature of the rotary engine is the fact that the heavier reciprocating parts of the standard type of engine are dispensed with, and it is not necessary to provide the customary massive flywheel or heavy counterhalance weights. Lastly. there is the attractive feature of the economy of space that is realized by doing away with piston rods, cross-heads, guides, and connecting rods, and the economy in material and labor which is consequently realized in manufacture
Now, the above wellknown theoretical and practical advantages of the rotary engine cannot be disputed and they have served to attract an amount of mechanical thought and skill which has resulted in some ex-

tremely ingenious designs by such men as Cochrane, Napier, Fletcher and later inventors. While it is true that hitherto no rotary steam engine, except those of the turbine type, has been so successful as to establish itself in competition with the standard reciprocating engine, the rotary principle has been applied with marked success to various types of blowers, ventila tors and pumps of which Roots' blower is the most notable example.
Chief among the difficulties whlch have hitherto stood in the way of the production of the successful rotary engine have been those of providing a satisfactory form of valve gear, steam ports, etc., for the admission and control of the steam and a suitable sliding


## abdtment and valve gear-colwell rotary engine.

abutment to support the reaction of the steall within the cylinder. The accompanying engravings of a twocylinder rotary engine, which have been prepared from drawings furnished by Mr. T. M. Colwell, 704 Atwood Building, Chicago, Illinois, show an intelligent attempt on the part of the designer to overcome these difficulties, and it will be noticed that both in the details and general plan of the engine, there is a departure from previous types. In the first place the engine is in duplicate and consists of two annular cylinders, mounted upon a common shaft, each cylinder having its own independent valves and abutment gear, the only parts common to the two being the eccentrics, link motion and reversing mechanism. The annular cylinders are true circles in cross section, the pistons being segments of a true circular ring, with the faces radial to the center of the main shaft. They are packed with split pistou rings, and it is stated that no difficulty has been experienced in securing steam-tight joints either in these or other moving parts of the engine. The adop case the dilemma has been weight of the abutment, to allow the use of a "swinging" mechanism that is exceedingly rapid in its movement. Intimately associated with the problem of the swinging abutment is that of the position and action of the steam ports, and the whole problem is met by using the regular Corliss valves and gear and placing the admission ports in close proximity to the abutment. There are separate valves for the admission and exhaust, and these are provided in duplicate (as shown in the illustration) so that by throwing over a single reversing rever both ever her using d possible by using double links for working the valve stems, so that one pair of eccentrics does duty for the whole eight valves. The arrangement is clearly shown in the general view of the engine, where the lower and upper steam chests contain the forward and reverse exhaust valves, while the forward and reverse admission valves and the recess which receives the abutment during its withdrawal are contained in the larger central steam chest. The operation of the valves and abutment is shown clearly in the detail views. In the upper view the piston has swept by the abutment which has just beenswung back into place, and the inlet valve is admitting team, the exhaust valve being at the same time open. In the lower view the steam has been cut off and the piston is about to sweep by the exhaust port. The abutment will be withdrawn only just in time to clear the front face of the piston as it passes forward in its path. When the engine is reversed, the ower admission valve and the upper exhaust valve are utilized. The right haud drawing shows the wechanisu for swinging the abutiont whiching the abutment, which is
made exceptionally light and is pivoted on a ver tical shaft whech is at
tached by a rocker arm and connecting rod to an oscil lating disk, as shown. The disk is oscillated by a horizoutal shaft which is attached to a rocker arm actuated by the valve gear link motion. As this arm reciprocates it engages a pin on the disk and draws it forward, thereby swiftly removing the abutment from the steam space. The instant the abutment is clear of the cylinder, the horizontal arm is tripped and the disk under the influence of the dash-pot, which is shown below the disk, flies back to its normal position and swings the abutment into place within the cylinder. The arrangement and action of the valves and abut ment indicate a careful study of the idiosyncrasies of the rotary engine, and in the matter of clearances at the abutment the design appears to be well up to the limit of possibilities of an engine of this particular type.

## Repairing Vessels at Cavité

Naval Constructor Hobson has some pertinent com ment to make on the question of dry-docking facili ties required by the government at Cavite, which he embodies in a report submitted to the Navy Department recently, on the question of the wrecked vessels raised in Manila Bay, which are now being repaired at Hong-Kong under his direcṭion. Mr. Hobson contends that economy demands that the United States estab lish its own dock and repair station, and shows that large sums would be saved which are now paid private firms at Hong-Kong for overhauling American warships.
His report is an argument in favor of the main tenance in the Philippines of an important navy yard and dry dock, where the largest and most powerful vessels of war may be overhauled and attended to. The repert states that in compliance with the burean's direcrion the three vessels under reconstruction, the "Isla de Cuba," "Isla de Luzon," and "Don Juan de Austrias," are about 80 per cent completed. The value of the vessels when completed, exclusive of armament, will be about as follows : " Isla de Cuba," $\$ 215$,000 : "Isla de Luzon," $\$ 215,000$; "Don Juan de Austrias," $\$ 180,000$. Total, $\$ 610,000$. Raising and refitting have cost about $\$ 304,000$, making a net gain to the government on the three vessels of $\$ 306,000$. The credit for this result is given to Naval Constructor Capps, who made the contracts. Thus the large engine parts were scarcely injured at all. This feature has an important bearing upon the wrecks still in Manila Bay which he is to examine with divers when the vessels now in hand are completed. The longer period that they have been immersed may not have seriously injured the principal parts, and there may be similar advantage to the government in further salvage, particularly as to the "Don Antonio de Ulloa" and the "Velasco," sister ships to the "Don Juan de Austrias," which, from all accounts, suffered less damage than those that have been raised.
Mr. Hobson adds : " There would be great advantage to the government in the establishment in the Philippines of a yard thoroughly equipped with docks and plant capable of doing all the work of docking and repairing of the navy. The British government is undertaking such an establishment here, though at great cost, involving the making and reclaiming of a large part of the land required. This would necessitate the enployment of Chinese labor. This labor is not ouly unlimited, but it is equal to practically all the requirements of modern industry. Chinese do all the work inside and out for all the departments of the shipyard, white supervision being required only to show what is wanted. The Chinese have a remarkable natural aptitude. Their industrial capacity is simply marvelous. To the extent of my observations and inquiries, there is no place in modern industry which they cannot fill.'
In his speech introducing the naval works bill in the Commons, Mr. Austin Chamberlain, in order to show the necessity for increased dock accommodation, stated that whereas, in the year ending March 31, 1889, the tonnage of the vessels built and building for the royal navy was 864.000 tons, on March 31 of this year it was $1,800,000$ tons: more than double that of ten years ago. The longest battleship then was 345 feet long and the largest cruiser 400 feet. Now battleships of 400 feet in largest cruiser 400 feet. Now battleships of 400 feet in
length are being built, and there are cruisers 500 feet length are being bu
The British government have in contemplation the immediate construction of five first-class docks for naval purposes solely. One of these new docks will be built at Chatham, and will be of sufficient dimensions to accommodate the largest ship afloat in the British navy. Another dock is to be built at Hong-Kong. This last named dock will be 750 feet in length and of dimensions to accommodate the shins of the "Majes tic" class. At Bermuda another fine dock will be added to the one already at that important point. At Malta two docks will be laid down, and the latest imprevements will be embodied in these docks, as also in the two to be built at Cape Town, Africa. These five docks are to be of stone and built in the most thorough manner and will cost an aggregate of $\$ 5,000,000$. - Army and Navy Journal.

## Sorrespondence.

## Can Insects Count?

To the Editor of the Scifntific American
That insects have some idea of numbers is claimed by Lieut.-Colonel Delauney in La Nature, Paris, July, on the base of a single observation made upon what seems to have been a small bug allied to Corisa, in New Caledonia. It was noted that this species was gyrating upon a leaf, first in one direction, then in the other, beginning with six turns and coming down in order to one. This was done once only, and no other specimens were observed. That the insect could count from six to one is thus considered proved upon what seems to one who has observed insects remarkably slim evidence.
The gyrating habit is a common one in insects and especially among some of the smaller moths or Tineids, who rarely come to rest after alighting without first turning several times in one or both directions in succession. Sometimes, without apparent cause, they will begin a dance that lasts for some time, almost exactly as described by Colonel Delauney, save that I have never noted the regular decrease in the number of turns. I cannot in the least believe that the insects have any real idea of number connected with these turnings; but I am nevertheless convinced that some insects do count up to considerably more than six.
An interesting illustration came under my notice in July, while collecting on the New Jersey side of the Delaware, at the Wer Gap. At the foot of the cliff, along the line of the railroad, all the old sumach canes were used by the little wasp Odynerus ornatus for breeding purposes, and from three to six brood cham bers were found in the canes. The cells were stored with the larvæ of the locust leaf beetle, Odontata suturalis, then about full grown. and as a matter of curiosity I counted those in the cells of one stalk. finding ten in each store. To ascertain whether this was uniform I cut all that I could find at that spot and invariably ten larvæ were contained in a completed cell. The little wasp begins by putting in one larva and then lays an egg upon or at the side of it. Nine additional larvæ are then brought in, one at a time for the larva is almost as large as the wasp, and then the cell is capped. Now this insect can not only count up to ten, but it can carry the idea of numbers for some appreciable time. After three or four larvæ have been placed in the cell the bottom one is lost to view and counting from above becomes an impossibility. The insect must, therefore, keep tab on its trips so as to neither over nor understock its cell. It is not a question of length of cell and simply filling a given space, for the diameter of the stalks varied, and as the diameter became greater the length of the cells became less.

It is worth noting that the habits of this little wasp have not been recorded, heretofore; but I have no doubt its allies with similar habits will be found to have the number sense equally well developed.

Johy B. Smith, Sc.D.
Rutgers College, New Brunswick, N. J.
August 25, 1899.

## Wood Seasoning by Electricity.

In a recent issue of a European trade journal, there is a description of a new process of seasoning wood and timber by electricity, known as the Nodon-Bretoneau process, which must be a commercial success, for it is claimed that the company's shares are now at a pre mium of nearly 600 per cent, says E. Theophilus Liefeld United States consul at Freiburg. The effect of the elec trical treatment seems to be to expel the sap and replace it by insoluble matter which will not putrefy, and to increase the tenacity of the wood and its resistance to vertical compression.
This is said to be the first industrial application of the principle of electric osmose. viz., if the electrodes in an electrolytic solution are separated by a porous partition and a current passes, the volume of the liquid in contact with the positive pole diminishes, while that in contact with the negative pole increases
The process is about as follows
The positive pole of a dynamo is connected with a lead grating, upon which the wood to be treated is placed. A solution, which is kept at the uniform temperature of $100^{\circ} \mathrm{F}$. by means of a steam pipe underneath the grating, is poured into the vat so as to almost cover the log of wood treated. At a public demonstration, the solution used contained 10 per cent of borax, 5 per cent of resin, and three-fourths of 1 per cent of carbonate of soda, the borax being used on account of its antiseptic properties and the carbonate of soda to help dissolve the resin. A porous tray the bottom of which consists of two sheets of canva with a sheet of felt between, is placed over the log, and a sheet of lead connected with the negative pole of the dynamo is placed above this.
When the current is turned on, the solution is drawn from the bottom anc! the sap driven out, and its place
a 10 -inch log is about seven or eight hours, and then the wood is slowly dried, which takes in the open air in summer several weeks or even months. It was stated that a unit of electrical energy was required for every six cubic feet of timber treated.

## Commercial Education in Russia.

Commercial education is continually receiving more attention and encouragement in Russia. Not only the government, but also commercial institutions, large firms, and even private individuals, are opening new commercial educational establishments, varying from the engineering college (polytechnic) opened by the government at Warsaw last year, where young men who wish to become civil, mechanical, chemical, or electrical engineers, architects, or surveyors, can obtain a thorough theoretical and practica! technical education, to the simple evening artisans' class, designed to give apprentices a certain amount of theoretical knowledge of their trade to supplement the practical knowledge gained at their work. Consul-General Murray ledge gained at their work. Consul-General Murray
says that between these two extremes come commercial schools, where boys can get a thorough commercial cial schools, where boys can get a thorough commercial
education as clerks or commercial men, and artisan education as clerks or commercial men, and artisan
schools, where the sons of workingmen can get a preschools, where the sons of workingmen can get a pre-
liminary education at certain trades, such as carpentering, locksmiths, etc. It thus only remains for the parents, and the boy himself, to decide what line he will take, and how much time can be given to his education, for which facilities are at hand from the time he first goes to school until he has finished at the engineering college at 22 or 23 . The two branches of commercial education which appear to be the most neqlected, as compared with Germany, are shorthand, it being extremely difficult to get a clerk who can take down a letter in shorthand, and then print it off on the typewriter, so common an accomplishment else where, and the careful special training of commercial travelers, which is carried to such a pitch of perfection in Germany, has little attention paid to it in Russia. -Journal of the Society of Arts.

## Igniting a Jet of Hydrogen.

C. G. Hopkins describes a method by which a jet of recently generated hydrogen can be ignited with absolute safety and without loss of time. As soon as the action begins, collect the escaping gas in a test-tube, and, when the latter is thought to be full of pure gas, remove it two or three feet from the generator and ignite the hydrogen in it ; then immediately attempt to light the jet of hydrogen with the hydrogen flanie contained in the test-tube. If the gas is explosive, it will explode in the test-tube and leave no flame. If, on the other hand, a flame remains in the test-tube with which the jet can be ignited, it is certain that the gas in the generator is no longer explosive. By adopting the precaution, therefore, of never lighting the hydrogen jet except with the hydrogen flame obtained as described above, absolute safety can be insured. as described above, absolute safety can be insured.
Attempts may be made to ignite the jet by this method as often as thought proper. and if the hydrogen is properly generated, the gas will be ignited in less than a minute.-Journ. Am. Chem. Society.

## Extinguishment of Fires in mine

An account of the application of liquefied carbonic acid gas to extinguish underground fires was given by Mr . George Spencer at the recent meeting of the In stitution of Mining Engineers, says Nature. At a colliery with which Mr . Spencer was connected a fire occurred in a heading, as the result of a fall of roof and sides on steam-pipes. The heading was built off with as little delay as possible, but notwithstanding all efforts to shut out the air, sufficient reached the seat of fire to keep it burning slowly. It was there fore decided to apply carbon dioxide, and for this pur pose six cylinders of liquefied gas were successfully used. It is not claimed that the method described can be successfully applied to all fires, but there are undoubtedly many cases which might be so treated. In case of fire on shipboard, the use of carbon dioxide would no doubt prove invaluable, as it could be quickly applied, and would not cause the same damage to cargoes as water.
"City of Rome" Strikes an Iceberg.
The recent collision of the "City of Rome." with an iceberg brings forcibly to mind one of the many dan gers to which transatlantic navigation is exposed. The vessel at the time was in latitude 4830 N . and longitude 48.44 W . The weather was foggy and a rain had just ceased falling when an iceberg was sighted near at hand, and the ship was slowed down to quarter speed. Shortly after this a massive berg loomed up over the bow of the liner, and before the engines could be reversed she struck. and her bow lifted several feet, the vessel finally sliding back into the water again.

Fortunately she sustained no damage beneath the waterline, the only marks of the encounter being her crushed figurehead and a bent bobstay.

The United States torpedo boar "'Talhot" is bein: fitted with machinery for the use of liquid fuel and the work is being done at the Norfolk navy yard.

A Labrador mail steamer reports that the Peary expedition steamer "Diana" has been met and hailed and that all on board are well. The "Diana" expected to reach Disco, Greenland, on July 29.
Major Ross, who was sent to Sierra Leone by the Liverpool School of Tropical Diseases to discover the malarial mosquito, has wired home that the malarial mosquito has been found and to send help to carry on further investigations.
Stonehenge, on Salisbury Plain, is for sale; 1,300 acres of surrounding land are offered for $\$ 625.000$. It is to be hoped that the British government will see fit to purchase Stonehenge, which is one of the most remarkable archæological monuments in the world.
The use of homing pigeons by the United States navy has become quite important, and we have already illustrated the system employed. Birds are now being educated by means of Long Branch steamers, in order that they may be used when Admiral Dewey arrives.
The recent explorations which have been made a Carthage have resulted in very important finds. The sanctuary of Jupiter Ammon has been discovered, and the current Supplement and the issue for next week will both contain illustrations descriptive of the dis coveries made in the Punic Acropolis,
The French surgeon. Dr. Doyen, has exhibited to nu merous doctors and students at the Kiel University cinematograph pictures showing various surgical opera tions. The doctor advocates the use of such pictures for the education of students, saying they are far more effective than the most elaborately written descrip tions.
Dr. Sven Hedin has departed on a new expedition to Central Asia. and expects to be absent about two years and a half, chiefly in eastern Turkestan and northern Thibet. The Russian government will give his expedition free passage over lines of railway and will provide him with an escort of Cossacks whenever he may require them.
The mining exhibits at the Paris Exposition will be most interesting. There will be two realistic repre sentations and demonstrations of the art of mining A shaft 5 feet in diameter will serve regular mine work ings, and all of the machinery will be of the regular type in actual use in mines. Visitors will also have the opportunity of visiting the catacombs under the city.
The International Commercial Congress to be con vened at Philadelphia. October 10, 1899, during the International Export Exposition, will be the first of its kind in all commercial history. Its members will be made up of delegates from the Chambers of Commerce. Boards of Trade, etc., and will come from Latin America, Africa, Australia, India, China, Japan and other countries.
The Director of the Geological Survey has just issued a pamphlet entitled "Maps and Descriptious of Routes of Explorations in Alaska in 1898, with General Information concerning the Territory." There are ten maps which are admirably executed. The pamph let contains special reports on various expeditions and general information concerning the Territory by geo graphical provinces and some very valuable tabulated information, including the gold production of Alaska. The various routes and means of transportation are clearly shown. The publication is intended for widespread distribution, and copies can be obtained by the aid of Congressmen.
In the United States the drug store seems to be the one place in which Americans get something for noth ing: postage stamps at government rates and free directories are the universal rule. Some New York druggists have decided to institute a reform in the matter of the directory at least, and have placed the book in an open box so that it can be reached by the dropping of a penny in the slot. The entry of the coin releases the spring, the lid may then be lifted and the book consulted. Many city druggists do not go to the expense of purchasing a new directory every year, but with the aid of a device of this kind it is probable that new directories would be forthcoming every year, and the proceeds might be devoted to charity and the druggist relieved of the "free directory" nuisance.
J. A. Brashear has just completed one of the pair of large astronomical camera doublets for the observatory of the University of Heidelberg, Germany. They are next to the largest ever made. They are 16 inches clear aperture and 80 inches focal length. Two of these doublets, each consisting of four lenses, are to be made and are to be used almost exclusively for the photographic discovery of asteroids. The reasons for making two cameras and objectives is to serve as a check. The track of an asteroid on an $8 \times 10$ plate is only about one-twentieth of an inch long for a three hours' exposure. As the curves of the lenses have nece::sarily to be very deep, the casting of the great disk was found to be very troublesome. The fund for the quipment was given by MissCatherine Bruce, of New York city.

The "Oceanic" started from Liverpool on September 6, at 7 P. M., for her maiden voyage to New York. It is expected she will arrive at New York at 7 A. M., September 13.

Nicholas Riggenbach, the engineer for many of the unicular and rack and pinion rallways of Switzerland, died recently. He directed the construction of the Righi Railway.
The Boston and Albany Railroad are now running trains into the new South Station at Boston. The trains of the Providence Division will run into the station.
The "Kaiser Wilhelin der Grosse" has lowered the time of ocean passage from Cherbourg to New York by two hours and fifty-three minutes. It covered a course over the northern route of 3.049 knots at an average speed of 22.08 knots.
The Baltimore and Ohio Railroad has appointed an Industrial Agent" whose duties are to advise manufacturers and others as to desirable locations for busi.ness enterprises. It is believed that this system will tend to develop the resources of the territory contiguous to the lines of the company

A Providence company has recently made an emery wheel 39 inches in diameter and 12 inches thick. It was built up on a special iron center 31 inches in diaweter, which ran on a $3_{\text {T }}^{5}$ inch shaft. According to The Iron Age, the whole affair weighed over 1,200 pounds. The machine was designed for grinding wooden balls.
A commission appointed some time ago to consider the feasibility of construction of a mountain railroad to the top of Mont Blanc has made a favorable report, and it is possible that the enterprise will be carried out. If so, the line will start from Chamonix and extend almost to the apex of the great mountain, a length of $61 / 4$ miles.
The Bald win Locomotive Works have secured a contract to supply twenty compound locomotives for the Saxon State Railway of the German Empire. The price quoted is 54.760 marks each. One firm in Breslan made an offer of 220 marks lower, but they required much longer time to make the locomotives, so the contract was given to the Philadelphia concern.
The Chicago Drainage Canal is to be opened next December, and the trustees are now spurring on the contractors, and extra prices are to be paid to certain of them who will guarantee the completion of their work in December. It is desired to have the canal completed and opened before Congress meets, in order to avoid the opposition that will be made at. the next session.
One of the most important American exhibitions at the Paris Exposition will be a model, some twenty feet long, of the Chicago Drainage Canal. In connection with this will be shown models of all the great variety of excavating and conveying machinery which was used in this important engineering work. The models will be shown in operation, and it is believed that it will be one of the most interesting of all the engineering exhibitions at the Exposition.
Following the wake of our Navy Department, the British Admiralty is about to add a modern steel floating dock to its docking equipment. The naval work bill, which recently passed its second and final reading in Parliament, contains an item for a first-class floating dock at Bermuda. Messrs. Clark \& Standfield, designers of the naval 18,000-ton dock now being built at Sparrows Point, will draw the plans of this new dock of 17,500 tons lifting capacity. At present they are building in England, from their own designs, a steel floating dock for the Siberian Railroad, which will be sent out in sections to Yalienwan and there put together

Nelson's old flag-ship, the "Foudroyant,". was built in 1789 and was launched in 1798 . She was wrecked at Blackpool in 1897, and part of her keel is now embedded in the sands at that place, and the remains of the vessel, her timbers, etc., are still in a yard at the place. At the Birminghan mint there are forty tons of copper from the vessel. Notwithstanding the fact that this ship, and the "Victorv," were the only two remaining vessels which remind ns of the famous sailors of the great fighting era, the Admiralty decided in 1892 to get rid of the relic, and she was sold to a German firm of ship breakers. Such an outcry was made that she was re-purchased, but in a curious hurricane on June 16, 1897, at Blackpool she broke from her moor ings and driving shoreward became a total wreck. She was sold for $\$ 1.250$, and the purchaser began the work of breaking her up. The first blast killed a woman who was passing on the beach, and this so disheartened the owner that he resold her to a syndicate. Some idea of the lively actions in the days of 80 gun ships may be seen from the data of powder and shot from the "Foudroyant" expended on the "Guillaume Tell." This was 162 barrels of powder, 1,200 thirty-two pound shot, 1,240 tiventy-four pound shot, 100 eighteen pound shot and 200 twelve pound shot.

The Odeon Theater, Buenos Ayres, is heated by electricity. This is not the first theater in the world to be so heated, but very few large public buildings have been warmed in this manner.
Electricity has been used to some extent for glass waking. It is said that with the electric arc, a pot of glass can be melted in few minutes, which, in the old process, would require hours.
Herr A. Adt has found that magnets made from wolfram steel are more powerful than those made of other steel, but on the other hand, they lose their magnetism faster than some of the others.
Marconi's experiments have been so satisfactory to the British Admiralty that a complete set of apparatus for wireless telegraphy has been supplied to the " Defiance," the torpedo schoolship at Devouport, for future experiments by naval officers.
The Paris, Lyons and Mediterranean Railway Company has undertaken the construction and operation of an electric railway between Fayet and Chamonix. The power is to be furnished by the river Arve. Each car will be supplied with its own motor.
The New York, New Haven, and Hartford Railway are, it is said, contemplating the putting in of the third rail system electric line for passengers between the Harlem River and New Rochelle. Their other experiments in this line have proved very satisfactory.
The second section of the Jungfrau railway has been opened by the company. It is only half a mile long and consists of a tunnel with a continuous gradient of 25 per cent. After the line reaches the Eigerwand station, work will probably be stopped until more capital is subscribed.
The London County Council has authorized the ex penditure of $\$ 50.000$ for the construction of an experimental system of underground electrical traction. The underground trolley is used so successfully in the United States that it hardly seems necessary to spend $\$ 50,000$ in demonstrating the value of a system which is already conclusively proved.
The manufacture of carbons for electric light is very interesting. The plastic mass is driven out through a
small aperture with the aid of a hydraulic press. They are then baked in furnaces and are automatically electro-plated with copper. The plating operation is particularly interesting and is described and illustrated in the current issue of the Supplement
At the Paris Exposition the central power station will be 1,200 feet long and 120 feet wide. There will be 45,000 steain horse power and 25,000 electrical horse power. The stean will be supplied at a pressure of 142 pounds per square inch. Electricity will be supplied at voltages of 125,250 , and 500 for direct, and 2,200 for alternating currents. The price for steam power will vary from 1.68 cents per horse power to 0.57 cent per horse power, depending upon the size of the engine.
The third rail has claimed its first victim in Brooklyn, N. Y. A track inspecior, while looking over the tracks of an elevated road, noticed that a screw in one of the rail clamps had worked loose. He was stooping to examine it, when he slipped on the ties and fell face downward on the electrically charged third rail. In falling he thrust one of his feet backward and the lower part of his leg rested on the tin roof of the stairway leading to the street, thus establishing a complete circuit, and the full force of the current passed through his body. It was found that he had been horribly burned on his face, hands, and legs.
According to The Electrical World, Prof. W. L. Bryan, of the University of Indiana, and Mr. N. Harter, telegraph superintendent, have been investicating the mental processes in acquiring proficiency in the use of the Morse code. The investigators conclided, after a variety of tests, that the study of telegraphy is analogous to that of learning to read and of acquiring a foreign language. "There is the same rapid improvement at first, the same dispiriting level just below the ability to understand ordinary conversation, the same rapid ascent into usable knowledge of the language, and the same long struggle, seldom completed, before one has freedom in the language."
We have already referred to electrically propelled ferryboats, which are to be used between Philadelphia, Pa., and Camden, N. J. At first sight it seemed as though there was no necessity for having electric ferryboats, but it should be remembered that with the ferryboat the service is not continuous, and for this reason is not economical. The engines and boilers can only be used part of the time, but with an electrical equipment the charging of the storage batteries may be continuous while the boat is in the slip. A vast amount of space will be saved, and the storage batteries may be placed near the keel. The charging may be done while the boat is in its slip at the end of each trip. There will be no dust or odor, the attendance will be lessened, and there will be no time lost in mak ing signals to the engineer, for there is no reason why the steersman cannot operate the motors from the pilot house.

COMPRESSED AIR TRACTION IN NEW YORK CITY. 'The extensive compressed air plant which has re cently been erected by the American Air Power Company at the corner of Twelfth Avenue and Twentyfourth Street, in this city, is now in active operation, and the new compressed air cars which it supplies are in regular service on the Twenty-eighth and Twentyninth Street lines of the Metropolitan Street Railway Company. The compressing engine is of special interest, both on account of its abnormal size and power and the high working pressure which is obtained. The single compressing engine is of 1,000 horse power, and the compressed air, after the fourth stage of cooling, is
our flrst page engraving and in the diagram already referred to.

There are four sets of intermediate coolers for reducing the temperature of the air at each stage of compression, placed conveniently on either side of the foundations. Each of the two inter-coolers for the lower pressures consists of a cylindrical shell containing a set of vertical cooling pipes, while in the coolers for the higher pressures a single coil pipe is used; the air in each case passing through the pipes, which are surrounded with circulating water at atmospheric temperature. The action of the system is as follows The air after compression in the low pressure cylinder is led through the first inter-cooler,
from which it issues carrying a press ure of 40 pounds to the square inch. It then passes to the first intermediate cylinder, where, after further compression, it is led to the second inter-cooler which it leaves at a pressure of 180 pounds to the square inch. It is next compressed in the second intermediate cylinder, then cooled to atmospheric temperature at a pressure of 850 pounds, and finally it is compressed in the 6 -inch cylinder and cooled to at mospheric temperature under a press ure of 2,400 pounds to the square inch, at which pressure it is led to a nest of storage cylinders in the chargiug room. The water used for cooling the air in the inter-coolers is taken from the North River, which is only a couple of hundred yards distant, through a 16 -inch water main, and after passing through the inter-coolers the water is returned to the river through a discharge main of the same size. Adjoin
stored in the flasks at the high pressure of 2.400 pound to the square inch. The engine, which is of the vertical cross-compound type, built by the Allis Company, of Milwaukee, is an extremely handsome specimen of the engine builders' art, and together with its massive brick foundations, it towers 60 feet above the ground floor of the building. Our front page engraving, which is taken at the level of upper floor of the engine house, shows only the engine proper and the upper courses of the wassive brick piers on which it is carried. The diagram of the whole plant shows the compress ars and the four inter-coolers situated on the ground floor of the building. The compressing engine has cylinders 32 inches and 68 inches in diameter by 60 inches stroke. Steam is furnished at a pressure of 150 pounds to the square inch, and working with the most economical point of cut-off the horse power is just 1,000 . Our illustration shows the massive character of the construction, and as an instance of the size of its parts we may mention that the crank shaft is 22 inches in diameter, with bearings 20 inches in diameter by 36 inches in length, while the flywheel, which is placed centrally on the shaft between the cranks, is 22 feet in diameter and weighs 60 tons. The air compressor, which is carried directly beneath, is of the four-cylinder type, the compressing cylinders being securely auchored between the masses of brick work which form the two legs of the piers. The low pressure cylinder is 46 inches, the intermediates are 24 inches and 14 inches, and the high pressure cylinder 6 inches in diameter, the common stroke, of course, being 60 inches or the same as that of the engine. The initial and first intermediate air cylinders are placed directly below the low pressure steam cylinder, and the second intermediate and high pressure air cylinders are below the high pressure steam cylinders. Each crosshead of the steam engine has four transverse arms, from which four distance rods lead down to connect with the corresponding crosshead to which the air pressure piston rod is attached. These rods are clearly shown on
 ing the engine charge main of the saise. Adjoinhouse. The cars on their return from a trip are run in on the tracks adjoining the storage cylinders, where suitable connections are made and a fresh supply of compressed air at the working pressure is fed to the storage cylinders, which are carried beneath the seats of the cars.
The cars which are being used in this service are practically the same in construction as the four-wheel cars which are used on the underground trolley lines. The car body weighs 6,000 pounds, the trucks 4,500 pounds, the air reservoirs 4,200 pounds, two motors weigh each 1,400 pounds, and the other parts and fit tings of the car bring up the total weight to about $91 / 2$ tons. The air motors are carried one upon each axle in two dustproof cast iron casings. Each axle is driven independently, one of them by the two high pressure motors and the other by the two low pressure motors. It will be thus seen that the cars are made to conform in respect of distribution of the driving power to the standard practice on electrically equipped lines. The high pressure motor has two high pressure cylinders, each 4 inches in diameter with a 6 -inch stroke, and similarly the low pressure motor has two cylinders 8 inches in diameter by 6 -inch stroke. In each case a $91 / 4$-inch pinion is geared upon the crank shaft and meshes with a 21 -inch gear wheel keyed on the middle of the car axle. The cylinders are bolted to the casing and lie outside of the same, while within the casing are the piston rods, crossheads, cranks, gears, and in fact all of the moving mechanism, and the whole is closed in with a cast iron cover, which on being lifted exposes all the moving parts for inspection or repairs. One of our engravings, showing one cylinder and its connections, is introduced to illustrate the construction of the reversing mechanism. The eccentric disk is not mount ed directly upon the shaft but upon a pair of parallel guides which are pitched at an angle to the shaft, one above and one below it, and have a motion parallel to its axis. When the guldes are thrust in toward the
arank the occentric disk is thrown up, and when they are drawn out the disk is thrown down, thereby giving a forward or reverse motion to the engine. The idea is not new ; but it has been ingeniously applied in the present instance, and lends itself admirably to the peculiar construction of these motors. It does away with one eccentric and the usual link motion. The bottom of the casing is filled with oil so that the motors are self-lubricating after the fashion of the Westinghouse and other fast-running engines. The construction is very compact and the whole design well worked out.
'The compressed air is carried in seamless steel flasks, which are placed beneath the seats of the car, three on each side, as shown in the accompanying engraving. The flasks are $211 / 2$ feet in length by 2 feet 5 inches in external circumference and they are tested, before being placed in service, to a pressure three times as great as the working pressure. From the ends of flasks the air is led through the heater, a wrought iron cylindrical reservoir which is supported between the two motors, as shown in the detail drawings of the car and the heater. The latter is charged with 60 cubic feet of hot water under a pressure of 210 pounds at a temperature of 400 degrees. After the pipe has passed through the heater where the air takes up sufficient heat to prevent the subsequent freezing of any moisture which it may contain, the air enters the reducing valve, of which we show a sectional view, where its pressure is lowered from 2,400 pounds to 320 pounds to the square inch. It then passes to the throttle valves at each end of the car, and thence to the injector, where a proper amount


HALF VIEW OF ONE mOTOR, SHOWING REVERSING gear.
of moisture is sprayed into the air from the heater, the temperature of the spray being, of course, $400^{\circ}$. The air with the moisture which it has taken up now passes through a spiral coil in the heater (see detail view), where its temperature is raised to that of the heater, or $400^{\circ}$, at which temperature and corresponding pres sure it enters the high pressure cylinders. From the high pressure cylinders it is carried direct to the low pressure cylinders and then exhausts to the atmosphere on the under side of these cylinders through a muffier. The exhaust, except at starting, is scarcely audible.

It will be seen that the system of the American Air Power Company differs very materially from that of the Hardie system, which we have already described at considerable length in this journal. (See Scientific American of January 30, 1897.) In the latter system the air is allowed to pass freely through the hot water of the heater, but this method has the serious defect

of being liable to carry excessive quantities of water into the motors, and of reducing the pressure in the heater from that of air to the pressure necessary to maintain the water at a temperature of $400^{\circ}$, and thes drawbacks are avoided by the type of heater used on these cars. The moisture taken up by the air has the double advantage of giving a better packing at the joints and of serving to maintain the pressure through out the full stroke of the pistons by continually vapor izing during the advance of the piston after the point of cut-off. The speed of the car is controlled partly by the variation of the cut-off and partly by the manipu lation of the throttle, the control in both cases being operated from the platform, where there are two handles, the upper one working the throttle, the lowe one the cut-off. The cut-off has four notches corre sponding to three variations in the speed and the full stop.
Under the present conditions of working, the cars have a capacity of fifteen miles with a charge of air occupying all space intermediate the seats, or the capacity could be increased up to as high a^ forty miles by placing on the cars as large a number of flasks a could possibly be crowded in, or it could be increased by raising the working pressure, a change which the company is now about to make. The motion of the cars is very agreeable; there is an absence of jar such as is noticeable on the cable and electric roads, and we understand that, as far as they have been tested they are giving great satisfaction. We are indebted for our particulars to the courtesy of Mr. W. Hoadley Knight, the engineer of the American Air Power Com pany.

Method of Developing Films in one Strip.
Mr. L. Jarvis, in The Photo-American, explains th following plan of developing ribbon films: I pin the ribbon film on a board. face up, and paint it with a wide, rubber-bound camel-hair brush, kept full of de veloper while brushing. It is as neat as it is simple, and, short of developing each exposure separately, is the most rational way of going about the work scien tifically. The materials necessary are two boards four feet long, one for developing and one for fixing upon a two to three-inch rubber-bound camel-hair brush some developer, hypo, blotters, and absorbent cotton From start to finish the fingers are not even wet with any chemical used. Before darkening the room (the bath-room, of course) l prepare two ounces of fresh developer and pour it in a small tray. In another tray or saucer I have old developer, and in still another ten per cent bromide of potash solution. There is also bottle of hypo solution with a coodly tuft of cotto handy. Now darkening the room and lighting my lamp, I spread clean blotters on my developing board which is of half-inch clear pine, four feet long and one
hand. Those whose dark rooms have no such conve nient arrangement can, doubtless, heat the blotters on top of the dark-room lamp. The films remain moist with developer nicely, and it is no trouble at all to keep them covered if well wet at first. I never had a case of spotting yet from unequal application of the developer by the brush, and I have developed a large number of rolls in this manner. In winter, if the film is brittle, a drop or two of glycerine in the developer will be found excellent. There need be no hurry, no worry about results, and an easier way of improving a negative by local treatment could not be imagined, as it all lies before the operator as plain as a picture, and the spots which need bringing out or retarding, as the case may be, show plainly. In developing a number of strips at once in a tray, one cannot stop long to doctor little patches, because the other films need constant turning ; so all get the same treatment practic ally, and we all know what the average is by such a manifestly imperfect method. Having finished develop ing, remove the pins, and, with a bit of blotter grasped between thumb and finger of each hand, remove the film to the other board, which is not covered. Pin it down securely, using about eight pins, and put it in the bath tub under the tap to clear it of stain. After a few moments remove it to the table and mop it over
to be more exact, two grains to the ounce of water will be strong enough to remove the greater part of the stain. All the stain should not be removed, espe cially from a thin negative, as the color in the film helps the printing in the shadows. After the acid treatment the full amount of washing should ensue, when nothing remains but to swab the film with gly cerine solution, made of glycerine, quarter fluid ounce (a teaspoonful will answer); water, eight ounces, or ou half-pint. After swabbing this solution over the nega tive two or three minutes, stand the board on end a dry, but not too warm, room, until quite perfectly dried. Then throw away the mixed developer, swabs, also the blotters; if much soiled, wash the developing brush well, and all is through with. Each board must be marked, and always used for the same operation

## A New Textile Plant.

Consul Atwell writes from Roubaix that some years ago an explorer in Asia discovered a plant of silken fiber, used by the Turkomans for the manufacture of withes and cord and by the Canagues for woven goods. This plant known as the Apocynum venetum, is sort of bush with slender cylindrical branches, some times six feet high. It grows in Europe, Siberia, Asia Minor, the north of Ludia, Manchuria, and Japan; but

general plan of 1,000 horse power compressors and charging station
foot wide, and, unrolling my film, pin it, face up, on to the board, two pins at each end, and two on the edge, about in the center, being plenty. I generally develop two or three rolls of folding pocket Kodak film at a time. Now filling my brush with water, I gently brush all the film over, enough to soften the emulsion, and then in the same manner paint the strips with fresh developer, keeping the brush moving slowiy over the film, enough to insure its being moist with developer all the time. The over-exposed ones come up first, of course, and those are first swabbed over with bromide, and then kept wet with old developer and bromide alternately. I apply these with a tuft of absorbent otton held on a stick with a rubber band, stick an cotton to be discarded each day. The other films meanwhile, have been developing nicely, and can be so manipulated that they finish with the rest. addinc ittle touches of bromide, old developer, or alkali, as needed, with a round brush. The under-exposed films are given all possible encouragement by treatment with developer suited to their wants, and by a hot blotter of the right width slipped under them. This is very effective accelerator, and helps the film as no amount of developer would. I keep a few blotters wound around the hot water pipe in summer, or the steam pipe in winter, and thus have them right at
gently with a large swab of cotton containing all the hypo it will hold. Continue to drag the swab of hypo over the film, taking fresh solution as necessary, unti it is completely fixed, which can be ascertained by un pinning one end and examining the back. I purposely do less swabbing at one end, so that, when that end i found to be fixed, it can be depencled upon that the whole roll is. This saves examining more than a couple of inches at the end.

When this part of the work is complete, I place the board in the bath tub, film down, and let it float upon the surface of the water, which is kept changing. If the weather be warm, the film can be painted with alum solution during any stage of the performance. It is well to do this after fixing always, even though not apparently necessary, as the film may soften in the wash water. Washing is very thoroughly accomplished in fifteen minutes. Everything upon the film which we wish to wash off, the hypo, to wit, is heavier than water, and consequently falls off better in the tub when on top of the water, than it would were the water on top of it. If the film was much under-exposed, and prolonged developinent has left it consider ably stained, it should be painted with a weak solution of tartaric acid after washing a few minutes. A saltspoonful of the powdered acid to a cup of water, or
it is not cultivated. and, up to the present, has been used only in the natural state. The branches die yearly, and in the spring new shoots start horizontally from the roots. It flourishes best where the land is under water during a part of the year, notably in the neighborhood of rivers that overflow at stated periods.
Under favorable conditions, the Apocynum develops quickly, and in a short time the branches form a thick growth, almost like a miniature wood. 'The best fiber is obtained by cutting the branches in midsummer, when the plant has obtained its full growth.

The attention of the Russian government was called to this plant in 1891. It is there known as the Apocynum sibericum, because it was first seen in Siberia.
It grows luxuriantly on the banks of the Amu Darya and the Ili, and the natives of these regions have used the fiber for many years for cord and fish nets. They value it not only for its great strength, but also because no care is required in its cultivation.

In 1895 the Russian govermment began to use it in the manufacture of bank notes, and since then the plant has been cultivated at Poltava. The results obtained thus far are consiaered excellent, and the time is doubtless near when the Apocynum venetum will take an important place in the textile market.

FIN KEEL CENTERBOARD FOR ONE-RATER
In the earlier days of international yacht races, the struggle was more distinctly one between types than it is to-day. The advocates of the wide, shallow hull, with its lifting centerboard, and the deep, narrow hull, with its fixed keel carrying a mass of lead on its lower end, were firm believers in the superior advantages of their favorite and widely divergent types. It was claimed for the American centerboard sloop that its wide beam, small displacement, big sail plan and narrow board dropped down to grip the deeper water and hold the craft up to the wind, was the ideal craft for speed and convenience. On the other hand, the advocates of the cutter type pointed with pride to the staunchness and weatherly qualities of the deep keel, outside ballast craft, with her sung sail plan, lofty and unobstructed cabin, and fine heavy weather qualities. The centerboard craft always was and always will be popular on a coast like our own Atlantic coast, where many of the harbors are shallow, because of the ease with which the draught can be lightened by merely lifting the board, and the yacht be taken into an anchorage which would be inaccessible to the cut ter with her deep. fixed keel. On the other hand, the enormous stiffening effect of that lump of lead, hung many feet below the waterline, was for years the object of covetous regard on the part of the centerboard skipper.

It was only a question of time when an attempt would be made to combine the sliding keel with the outside lead, and of late years, in the smaller boats, some very ingenious combinations for this purpose have been brought out. One of the difficulties attendant on weighting a centerboard of the ordinary triangular shape is the change in the trim of the boat which occurs when it is drawn up To preserve the trim, the keelshoul lift vertically instead of swinging on a forward hinge.
We have been favored by Mr. H W. Fairbrass, of London, with drawing of an ingenious lifting bulb keel, in which a true vertical lift is accomplished by making the kee plate in three jointed portions, the upper two of which work on a cen tral pivot somewhat after the man ner of a pair of scissors, the Iower portion of the plate, carrying the bulb, being hung from the same pivot. Two jointed arms pivoted at their upper extremities at the top of the centerboard casing, and at their lower ends to the two upper sections of the keel-plate, together with a pair of hoisting ropes, cont plete the toggle joint arrangemen by which the plate shuts up within the casing. The hoisting ropes ar wound upon a drum outside the casing, which is operated by a worm and wheel.
In the drawings the keel is shown applied to a one-rater, and the dimensions, weight, etc., for a boat of this size are as follows: The casinir measures $21 / 2$ feet in height. 41 feet in length, and 1 inch in width The width of the plates is $21 / 2$ feet and the total drop of the keel 4 feet and the exposed area is $101 / 2$ square feet. The lead bulb is 8 inches in depth by 4 feet in length and its weight about 800 pounds. The members of the keel plate, it should be noted, are held in a true longi tudinal plane by means of a pin which is riveted firmly to the left hand upper section of the keel and moves in radial slots cut in the right-hand and lower sections The plates are recessed into each other as far as practic able so as to reduce the projecting edges and present as little resistance as possible to the water.

A Eecord Year for Manufactures.
American manufacturers made their best export rec ord in the fiscal year just ended. Not only were their exportations larger than in any preceding year. but for the second time in the history of our foreign com merce they exceeded the value of the imports of manufactures. In the fiscal year 1898, for the first time in the history of the manufacturing export trade, the exportation of manufactures exceeded the importa tion of manufactures, the total value of exports of manufactures being about 25 per cent in excess of that of imports of manufactures. In the fiscal year 899. however, despite the increase in imports of manufactures, the total exportation of manufactures was 30 per cent greater than the importation of manufac tures, being $\$ 338,667,794$, against $\$ 259,570,293$ of imports of manufactures.
Prior to the fiscal year 1898. imports of manufactures were always greater than exports of manufactures. From 1888 to 1897 imports of manufactures ranged about $\$ 1,000,000$ a day, with the single exception of 1894. During all that time the exportation of manu-
factures was steadily increasing, so that in 1897 they amounted to $\$ 277.000 .000$, against $\$ 130,000,000$ in 1888 , having thus more than doubled in that period. In 1898 they were $\$ 290,697,354$, and in the year just ended, as already indicated, $\$ 338,667,794$. It was not until 1898 that through the combined reduction of imports and increase of exports the tide turned in favor of American manufacturers, and in that year the total exports of manufactures were, for the first time, greater than the imports of manufactures, being $\$ 280,697,354$, against $\$ 230,897,676$. In the fiscal vear 1898, the exports of manufactures exceeded the imports by $\$ 59,799,678$, and in 1899 the exports of manufactures exceeded imports of manufactures by $\$ 79,097,501$.

## ATRussian Aretic Port.

A new port was opened July 5, 1899, near the Catherire Harbor, the extreme northern part of Russia's possessions. The city will be called "Alexandrovsk" in honor of the late Emperor. He sent his Minister of Finance to visit the northern coast in 1894. The Minister reported that the location of a city at a point where a good harbor could be found was necessary to the development of the Mourman region. Kola, the principal commercial town of that region, is on a narrow, shallow gulf, and is inaccessible to ordinary vessels, and thus forces the trade of the north of Russia to seek Norwegian ports. The Catherine Harbor was found to be located near the center of the marine industries of the Mourman coast, with ample depth to admit the largest steamers, and it is a curious fact that the Gulf Stream keeps it from freezing during the winter. In 1896 the Ewperor ordered this harbor im-

proved and the city laid out, which has been carried out under the supervision of the Minister of Finance and the governor of Archangel at the small cost of $\$ 250.000$, inside of five years from the time that the improvement was first suggested. Work was begun only three years ago Consul-General Holloway states that the new port of Alexandrovsk will soon become an important cente for the industries of northern Russia, as it is capable of enormous development.

## Dust from Africa in Europe.

At the suggestion of Prof. E. Ray Lankester, Lieut A. G. Froud has sent us a copy of a report by (i. T Prior upon some fine brown dust collected on board the Peninsular and Oriental steamship, "Sumatra" during a thunderstorm in the Galita Chamel, in the Mediterranean. The dust contained about 3is per cent of doubly refractive grains, composed chiefly of car bonates of calcium, magnesium and iron. After treat ment with hydrochloric acid, the insoluble residue was for the most part without influence on polarized light and consisted mainly of silicate of alumina (clay), with a little organic matter; only a few angular grains of quartz and one or two very strongly refractive and doubly refractive grains, probably of iron, were observed in this insoluble residue. The dust was thu of the nature of an argillaceous and calcareous sand, and may have been carried by wind from the north of Africa. In his report, Mr. Prior remarks: "An ac count by C. V. John, with analysis, of fine brown dus which fell in Hurgary in February, 1896, appeared in scientific publications at the time. This dust, like the above, was characterized by the almost total absence of quartz, and by the presence of grains of transparent amorphous clay material. It differed from the above however, in not containing any large amount of car bonates. The similarity in chemical composition of
this Hungarian dust with that of Nile mud is pointed out, and the suggestion is made that the dust may have been derived from Egypt."-Nature.

A New Development in Locomotive Bollers.
A large locomotive has recently been turned out a the West Albany shops for the New York Central Railroad, which embodies a novel and promising featur of boiler construction. It was built from the designs of Mr. Cornelius Vanderbilt, Jr., who has lately been giving considerable attention to the question of loco motive improvements. It is well understood that the tandard type of firebox as now constructed is one of the most costly features in the boiler. On account of its rectangular shape and flat sides it has to be heavily stayed to the outer shell of the boiler and is one o the parts that call for most careful attention and most frequent repairs. In the new locomotive a tubular corrugated furnace. 64 inches in diameter and 11 fee $21 / 4$ inches in length, is placed eccentrically within the back of the boiler shell, which, in the neighborhood of the furnace, is 7 feet $15 / 8$ inches in diameter. The cor rugated furnace is supported at its front ends by sling tays which are attached at the tube sheet. At the rear the large furnace tube extends about 6 inches be yond the back face of the boiler, to which it is flanged. A brick wall, 20 incines in height, extends above the grates at a point about 30 inches to the rear of the tube sheet, the space between the brick wall and the tube sheet forming a combustion chamber.
The furnace presents a heating surface of $1911 / 2$ square feet, and in the 332 tubes there are $2,1641 / 2$ square feet, the total heating surface therefore being no less than 2,356 square feet. There are $35{ }^{2}$ square feet of grate area. The total weight of the engine is 160,000 pounds, and a boiler pressure of 185 pounds to the square inch is carried.
As far as we know, the use of the corrugated tubular furnace in a locomotive of the standard type is entirely new in America; the only other instance of the use of the corrugated furnace being the Strong locomotive, which, among other peculiarities, carried a bifurcated boiler with two separate corrugated fire boxes. If the manifest advantages of this system of construction can be utilized in a locomotive of the standard type. Mr. Vanderbilt has set a very valuable precedent, which will probably be extensively followed in American locomotives.
The boiler has shown excellent steaming qualities and as compared with the standard engines of the road it marks, in this respect, a rlecided advance. Evidence of this was shown during a trial trip with sixty-seven empty cars, when the pressure ran un to 195 pounds in spite of the fact that the two pop valves set at 180 pounds were blowing off strongly. We shall give illustrations and fuller details of this engine in an early issue.

## Car Conprinus in England

The committee apposinted to examine designs for improved couplings for railway vehicles in Great Britain state that they are prepared to receive any photographs or written or printed description of automatic or non-automatic couplings for railway vehicles, but not with a view of making any selection from the various inventions which mav be submitted. The committee are not at present prepared to receive models of any couplings, but if models or personal attendance is required, the persons interested will be notified. All such drawings and photographs or descriptions must be sent to the Secretary, 6 Old Palace Yard, London, S. W., England, on or before October, 1. 1899.

The committee does not give any assurance that communications made to thell on the subject of the inventions will be protected, so that we recommend those of our readers who expect to submit their ideas to this committee to protect their inventions. The report of the committee will undoubtedly be of far reaching importance, and the question of automatic couplings is now agitating the British newspaper press as well as the technical press.

Railmay traveling in Algeria certainly leaves very much to be desired. From Algiers to Biskra is 400 miles, and it requires thirty-six hours to perform the journey. The trip from Oran to Algiers is 263 miles, and this requires twelve hours. Sleeping cars are re quired on all night trains and restaurant cars on all through trains.

We regret to note that M. Gaston Tissandier, the We regret to note that M. Gaston Tissandier, the
French physicist and aeronaut, died on September 8 at Paris. He was for many years editor of La Nature.

## September 16, 1899.

 front rank when any public work connected with the beautifying of our cities is concerned. Naturally New York, being the howe of the society, is the subject of would be the scene of Admiral Dewey's home-coming, dent of the National Sculpture Society, Mr. J. Q. A. Ward, that the sculptor members be requested to make plans for the decoration with sculpture of a triumphal arch, which has been considered at all times the greatest tribute which can tribute which can be made to a re turning victor. The scheme was warmly indorsed by the sculptors, all volunteering to do their share of the work freely. A special committee $w$ as appointed to confer with the Dewey committee, and the scheme was received with en thusiasm. When the enormous quantity of sculpture is considered, it will be seen that these public-spir ted publ hav ted men have eally made conributions which in a more durabl material, would have been worth a million of dol-lars. Neither time nor money was available to make a permanent memorial, so a more evanescent material has been employed.
Madison Square was the logical place for the arch. Twenty-fourth Street was taken as the axis for the arch, and the colonnade starts on the north side of Twenty-third Street and ends on the south side of Twenty-fifth Street. The plans were drawn with special care by Mr. C. R. Lamb and were approved by the sculptors and the Dewey committee.
The "Arch of Titus" at Rome was taken as being the best ancient example which could be richly decorated with sculpture, and it was modified to meet the
§riantific : ㅋmericau.

## THE DEWEY ARCH.

The National Sculpture Society is always in the its special care. When it was known that this city Mr. Charles Rollinson Lamb proposed to the presi-
special conditions. The Dewey arch was enlarged from the classic prototype, and instead of being supported on two piers, a new penetration was given east and west, the arch being deepened to one-half of the width in measurement, giving it four piers, and, therefore, adding much to its lightness. Extra columns have been added to the side, giving two groups of two columns each, thus making a motive for the colonnade The arch is approached from the south by six double


MODELING FIGURES FOR THE DEWEY ARCH. the front of the piers are the "Call to Arms" by P.
our power as a maritime nation. The great groups on Martini; "Battle" by Karl Bitter: "Return of the Victors" by C. H. Niehaus ; and "Peace" by Daniel C. French. Above these on the attic acting as finials to the eight columns are full-length figures of heroic size of the great figures in Anerican naval history, Commodore Paul Jones by E. C. Potter, Commodore Hull by H. K. Bush-Browis, Commodore Perry by J. S. Hartley Commodore De catur by G. L. Brewster, Com modore McDon ough by Thomas S. Clarke, Admi ral Farragut by W. O. Partridge, Admiral Porter by J. J. Boyle, and Cushing by A. Lukeman. The remainder of the attic is taken up by symbolic pan els and inscrip tions. The four spandrels over the main entrance have bas-reliefs symbolizing the Atlantic and Pa cific Oceans on The north by R . H. Perry, and the North and Eas Rivers on the south by I. Kon ti. The keystones of the arch will be surmounted by eagles. Topping all is a quadriga with a winged "Victory", the most appropriate
rophy columns arranged in pairs, three on either side and the columns at Twenty-third Street and Twenty fifth Street being reinforced by an extra column on either side, thus repeating the same effect of two columns when seen from the north or south. The first or south pair will have the nort stang by F . r south pair wave goups af "ary by Bissll "'I, Navy" Deoration by Her A. will be placed on each double colu!nn.
The arch proper is about 70 feet wide by 35 feet deep, while the height from the roadway to the wreath in the hand of "Victory" will be 100 feet. The sculp tural decorations of the arch are intended to symbolize
subject for the crowning feature
of the arch. It is by the Society's president, J. Q. A. Ward. There are also reliefs flanking the arch and on the sides representing the "Progress of Civilization" by J. Gellert, and the "Protection of Our Industries" by W. Couper. Eight portraits of admirals are added as an enrichment to the spandrels of the smaller arches on the Twenty-fourth Street penetration. The upper end of the colonnade will have two large groups also.

It might well be asked how it is possible to build this enormous arch in the space of six short weeks. It only is rendered possible by that beautiful plastic material called "staff," which first came into prominence in this country at the Chicago Exposition of 1893 . It is


DEWEY ARCH NOW BEING ERECTED IN NEW YORK CITY.


MODELING IN STAFF A HEROIC FIGURE OF LIEUT. CUS fing.
a cheap substitute for more durable material, and pre sents a handsome appearance. It consists of plaster of Paris mixed with cement and fibrous materials. The arch proper is built of wood and looks not unlike a well built scaffold. This is being entirely overlaid with staff, and the figures will be placed in position at the proper time. Some of the larger pieces will be mo deled directly in place, but most of the sculpture has been enlarged in the Madison Square Garden, where our staff photographer $h$ as been able to get some photographs of the animated scene by flashight posing.

The sculptor makes his ally 2 or 3 feet high; he then from it. and this is taken to Madison Square Garden where it is enlarged under the direction of Carl Beil, who had charge of the men who did the same work at the World's Fair. Usually the head and hands are modeled full size in the sculptor's studio. A wooden carcass is built to support the head and hands, and then the work of building up the man 12 feet high is begun. All of the trunk and legs are outlined with wire netting, the staff being applied over this. Pieces of wire cloth, burlap, and even excelsior are freely used. The plaster is brought in pans and is applied with trowels and coarse medeling tools. Drapery is readily obtained by using burlap dipped in the plaster. Some of the sculptors do their own work, others employ pro fessional modelers. The proportions are kept with calipers and by means of plumb lines and scales which correspond to the ruled squares of a painter's cartoon There is not very much finishing, except to face and hands, and the bodies are freely shaped with hatchet and rasps. Some of the figures were modeled full size, as in the alto-reliefs shown in one of our engravings here the actual modeling clay and not the plaster is be ing used. A wooden framework blocks out the main masses and the clay is modeled directly on this. A small sketch a few inches high is of course made first.
The staff for the architectural part of the structure was modeled elsewhere, and the first piece was applied to the arch September 7. Admiral Dewey is certainly to be congratulated for the splendid trophy of victory even though, a few days after the celebration, it will be only a memory.

The Sanyo Railway of Japan has recently intro duced dining cars, and sleeping cars are also to be run

Amber in Lastern Prussia.
Amber is found all along the Prussian shores of the Baltic, but principally in the peninsula of Samland. All amber, found everywhere, is state property, but the state cannot mine amber without the permission of the owner of the ground. Before the beginning of the present century, digging was the only means employed for obtaining amber. It was done in an irregular manner, and in 1862 dredging was practiced. This was continued until 1890, when mining by means of shafts was also resorted to; diving has also been practiced with great success. Amber occurs in the so called blue earth, a sandy clay with many grains of quartz and granite. In the dry state the earth is green and when it is wet it becomes almost black. The blue earth is washed with water, the big lumps being re duced with the help of mallets, and passed over sieves and the slime is returned to the sea. The shafts have a depth of from 30 to 60 feet, and further inland they may be double this depth. One mine has nearly a thousand employes. The inferior pieces of amber are made into what is called "ambroid." The pieces are washed and dried, coated on the outside with some chemical, and are then moulded with the aid of heat and pressure.

## our 'Trade with Arica.

Public interest in African affairs is very great at the present time, while that continent is in such an un settled condition. Africa is regarded by many commercial nations as a great future market for exports, and the demand for United States goods is not at all backward. Exports from the United States to Africa were in the tiscal year of 1899 more than five times as great as they were in 1889, amounting in the former year to $\$ 3,496,505$, and in 1899 to $\$ 18,594,424$. From "Cape to Cairo" and from Liberia to Abyssinia American manufactures and American foodstuffs are steadily making their way into public favor, and the consumption is constantly on the increase. Railroad bridges in the Nile Valley, mining machinery in the gold and diamond districts, cloth and foodstuffs are all eagerly sought for. Exports from the United States to Africa have grown more rapidly since 1893 than those to any other of the grand divisions of the world, while Asia and Oceanica come next, and they are followed by Europe, North America and finally South America.

It is an encouraging sign that not only are our ex ports to Africa growing rapidly, but they are evidently taking the place, to a greater or less extent, of those articles formerly supplied by other countries. The British South African Export Gazette says "that American competition has to be met in all departments of trade. This competition is also not to be ignored because the shipments in many cases are smali in quantity and value, as this is a peculiarity incidental to the opening of all new markets. The energy which our transatlantic cousins put into all of their new departures is earnest of a sufficiently active exploitation in the near future. This can only be met by renewed care and energy on the part of English firms in cultivating the South African markets."

## The Current Supplement

The current Supplement, No. 1237, has a number of most interesting articles. "Notes on Manila and Cavite" describes some curious features of our new possessions. "Victoria Regia" is the subject of a large engraving dealing with this curious aquatic giant. "Archæological Discoveries at Carthage" refers to the important discoveries which have recently been made upon the site of one of the most interesting cities of antiquity. There are a number of articles devoted to trade besides the regular consular page. "Manufacture of besides the regular consular page. "Manufacture of
Carbons" describes most ingenious automatic maCarbons" describes most ingenious automatic ma-
chinery for plating the carbons and presses and baking furnaces. "The Relations of Physics and Astronomy to the Development of the Mechanic Arts" is the conclusion of Prof. Abbe's interesting paper.

## Contents



RECENTLY PATENTED INVENTIONS.

## Agricultural lmplements.

harrow.-Charles ohaven and fred P. Uhbig Fort Madison, Iowa. This clip-guard harrow-tooth holder has a solid front recessed for the reception of the tooth and adapted at the same time $t_{0}$ strengthen and
hold the tooth fass in place. The clip-guard is drawn old the tooth fast in place. The clip-suard is draw gether by means of a bolt and nut at the back of the lip combined with the bar, tooth and bolt. This de vice differs from tooth-holders made of two pieces and olted together at the back of the bar, as th:se give a opportunity to th
loosen the tooth.

Bicycle-Appliances.
AUTOMATICALLY-OPERATED BICYCLE-PUMP John S. Bcbb, Kittanning, Penn. This invention ,rovides improvements in bicycle-pumps connected with into and out of operative position by the rider while mounted on the machine. In its essential features the nvention comprehends a novel construction of pumping and distributing mechanism adapted to be dispose within the frame-tubing, and so arranged as to be operated by an eccentric of crank-mechanism con
either the drive-wheel axle or the crank--lxle.

## Electrical Apparatus.

electric meter.- Albert Peloux, Geneva, sintzerland. The invention provides an electric meter of the motor-type, in which a motor system moves a
metallic disk or cylinder. The disk, in turning between the poles of permanent magnets or electromagnets. ac-
quires a speed of rotation in proportion to the electric evergy expendect. The meter has the merit of dispensing with movable swires upon the armature, thus making an sists only of a spindle, two iron cores, a disk. aud a movable brush. The
or five-wire system.
electric swttchi- - Albert e. Wells, Pittsfield, Mass. The electric switth has a terminal-block box provided with a cover having a slot registering with
a slot iu one sille of the box proper. A two-armed slatter within the box has one of its arms pivoted on the
inside of the box, the arme of the shatier being atapted to close the slots. This switch is simple in construction, positive in its action, largs in capacity, and is arranged to
insure a sinultancous breaking of all points in a circuit and to retuce the arcing to a minimu:n.
Visual signal apparatud. - Rudolf Ein-
bigler, Manhattan, New York city: The invention bigler, Manhattan, New York city. The invention
provides an electrical sigual device particularly adapted provides an electricel sigmal device particularly adapted
for use in oftices or buildings. and comprises a series of main aununciators placed in a suitable position and npon the inuer or normally-indden side of each one of which is
placed a vumeral designating a persoln to be called. In counection with each one of the main amnunciators an
auxiliary anumeciator or a series of auxiliary annunciators is provided. electricalls operated and controlled from varions monts of a building or the like, remote from
the main board. so as to indicate the calling person to the persun called.

Engineering-Improvements. cut-out cock for engineers' valves. Dennis Brown, Somerset, Ky . This cut-out or stop-
cock is especially designed for use when a number of locomotives are coupled to a single train, the arrange-
went then enabling a connection to be established be tween the train-line pressure and the train-pipe gave, so that each engineer can see what pressure is in the trainpipe and what is drawn off by the engineer of the leading ngine. Should the leading engine not charge or control stantly charge and handle the brakes.
GOVDRNO Cup
GOVERNOR CUT-OFF.-MARTin O. Arnegard,
Hillsborough, N. D. The governor cut-off is an improve ment on a similar device patented by the same inventor The novel features of the present invention are found in the construction of the pivoted bar forming a flexible downward extension of the vertically-slidable governor shaft" or bar, in the tension adjustment for the springcounterbalance for the governor shaft or bar, whereby the speed of the engine may be changed at will without and in the improved attachment of the governor-arms to the cross-head of the sliding shaft or stem.

## Mechanical Devices.

Wave-motor.-William a. Norton, Port Richmond, Richmond, New York city. The wave-motor
comprises two connected floats, on one of which a rockshaft is mounted operatively connected with the other
foat. Gear-wheels have clutch-connction foat. Gear-wheels have clutch-connection with the power-shaft and are. engaged by racks operated alter-
nately in opposite directions by the rock-shaft A water nately in opposite directions by the rock-shaft. A water-
motor is connected with the power-shaft. Mechanism actuated by the rock-shaft supplies water to the motor. The waves rock the foate, thereby operating the racks
impart motion to the power-shaft. At the same tim water is supplied to the motor. The rack-and-gear moou is designed to start the operation.
STENCILINg - Machine. - Stcart B. Moore.
Bronkly. New York city. In Bronklyn. New York city. In shipping goonds it is al-
wayse desirable to stencil the address. But to use metal thacils for each shipment would be too costly. It is therefore desirable to be able to make paper stencils for forming such stencils is provided ty the present invention. The machine comprises two superposed
connected disks respectively carrying dies and punches adapted to receive the etencil-shect between them. An index plate or diek is fixedly secured to the punch ang-disis and is carried above the frame. The disks
aric pivoted to rotate upon a blo:k reciprocated with disks in the ruideway of a frame
box-sealing machine. - Joseph T. Craw flaps of paper boxes after the boxes have been filled and is of such simple construction that the boxes may be
conveniently manipulated by a siagle operator. The inrention provides for the distribution of cementing or gluing material to the portions of the flaps to be sealed. The cement or glue is antomatically applied and the
flaps folded to a sealing position. The operator has flaps folded to a sealing position. The ope
merely to feed the itlled boxes to the machine.
dTomatic lathe. luche a carson, hopeau improved lathe designed for automatically turning,
boring, sawing off, and completely finishing small artion
cles of wood. The lathe comprises a cles of wood. The lathe comprises a support for a
etick. The stick is moved in the support by a spiked wheel which can be: rotated intermittently in apposite directions and through different distances. The stick can be held in the support against accidental inovement, and can be operated upon by vario
positions to which it is moved.
computing-machine.- John J. Wall and HerMan Rogalsky, Buhler, Kans. This invention pro venient computing-machine for the purpose of finding vent at a glance how many pounds of flour or feed are be given in exchange for a certain amount of bushels or pounds of wheat at a certain number of pounds to th bushel, thus saving much valuable time in computing and also avoiding the possibility of error in separately giguring the accounts
hoop-machine. - James Fowley, Cobden, III. This machine makes barrel-hoops directly from the log, with one end tapered to a thin edge to form the lap and
the other end pointed to form the outer wrap, With the vertical or slicing saw are connected a series of five vertical cutter-heads arranged in front of the saw, one set having relatively stationary bearings and the other set having respectively blades with V -shaped cutting edges and plain blades, means being provided for giving them an automatic motion to and from the log to form pointed nds and Animal-Trap.--Williami H. Harden, Quitman, connected by a paseare with a econd compartment. In the passage is a tilting platform a gate controls th opening of the passage into the second compartwent the platform tilting into, and out of register with the gateway of the gate. Connections between the gate and
the titiong platform cause the platform to open the gate the tilting platform cause the platform to open the gate
as it moves into register with thie gateway. A clockmechanism readjusts the tilting platform. The various operations described are effected by the animal as eekn to escape
motor,- Eidgar L. gabver, Gainesville, Tex. The he encrey is stored up, by a spring and conserved of ficiently. Operatively connected with a rotatable spring carrving and spring-actuated drum is a train of gean whecls which drive a slaft. A pinion is splined on the haft and is adapted to slide thereon in or
the ciifferent gear-whects to vary the speecl

Ratchet-mechanism - Louis P. Wellman, Taurus, N...J. This mechanism is designed to convert reciprocating into rotary motion. The ratchet-whee has teeth provided with sloping sile surfaces. An
operating hever is provided formed in two eeparable halves having a common pivot and drawn together by ever have their inner ends beveled and slightlv round at the cornere. The device is particularly desimed for use with mer
machine-dun.--Hom. Edwin M. Capps. San Diego, Cal. The invention relates to improvements in rapidAring machine-guns; and it refers particulariy to gmons
in which the barrel and firing mechanism are arranged to in which the barrel and firing mechanism are arranged to ugate series of cartridges arranged to be zuccersively fed
into a firing position. The invention provides a novel
barrel and firing mechanism and autonatically-fed cart-ridge-holders designed to fire any of the ordinary forms of military cartridges in which premature firing is rendered impossible and in which non-explosion will not impede the firing action of the gun. The invention also furnishes a novel method of sighting by means of stadia

Miscellaneous Inventions.
packing-case. - Thomas Mileer, Jr.. and Willism O. Joslin. Springborough, Ohio. This inventiou seeks to provide a knock-down tolacco-case with a gether and so arranged that there are no projections to prevent several cases from being packed closely together. The end-pieces of the case have cleats on the cleats on the inner side. Through openings in the cleats fastening bolts pass, each consisting of sections arranged at right angles to each other. A shoulder on one of the sections engages the inner side of the case; and nuts engage the screw-threaded portions of the bolts. By
loosening the nuts on the sides, the case expands and loosening the nuts on the sides, the case
can then be readily lifted from its contents.
dUST-CART.-Franz Loos, Carlsbad, Austria-Hungary. The cart can be filled without causing unpleasant place. A special feature of construction is a portion forming a dust inlet and having a sliding bottom and a sliding cover, both connected with a bell-crank lever whereby they are operated. Swinging on the cart is dust-box having a slidıng cover, which dust-box is capable of being connected with the sliding bottom, the
cover of the box being engaged by the bell-crank lever. WAGON-S'TANDARD. Pu wor WAGON-S'TANDARD.-Reinhold Klatt, Strong
City, Kans. The standard hae a body and base, the lat City, Kans. The standard has a body and base, the lat
ter being provided with a downwardly-extending marginai flange inclosing the end of the bolster. Fastening devices are passed through the bolster and the base of the standard. A etrap is fastened down on the top of the bolster and has engagement with the base of the
standard. The standard does not in any way weaken the bolster to the extent necessary in the applicatica of the ordinary standiards.
Acetylene cias machine - Jacob D. Katfman. Charley b. Titus, and adnah e. Vanarsdale.
Little River. Kame. It is the object of this invention to Little River. Kans. It is the object of this invention to
provide an acetylene-apparatus having a large carbid capacity and so arranged that the generator is completely surrounded by water. thus keeping the gas cool. With-
in the gasometer the generator is arranged. Removably placed in the generator are carbid-holders, each having a perfor:tecl top or cover through which water is passed. A gas-ppe leads from the lower portion of the
gencrator and upward into the gasometer and has a portion coiled around the generator. Distributing and blow-off pipes are provided.
shade-frame.-Franklin E. Howard, Buffalo, N. Y. This shade-frame for electric lamps has support-
ing-arms adapted to engage the lamp. To the arms a continuous ring is attached having tapering sides on which the shade is supported. A continuous flange is
projectel npwardly from the inner edge of the ring and projectel upwardly from the inner edge of the ring and is capable of yielding inward) to almit the shade to the
ring. The flange stands out normally to hold the shade
elevator-Carrier.- Egbert J. Hooker, Poultney, Vt. The present invention provides a carrier adapt-
ed for use in quarries, which carrier is so constructed that it will travel on an elevated track or cable at any de sired speed, it being possible to stop the carrier at any desired point on the cable or track. The brake used for
the carrier does not in the least interfere with the cable or track and operates independently of the cable. The parts are so constructed that when the load is in dumping position, the carrier will be automaticully held st ionary.
exercising device.-abrmm a. Hendrickson. Jamaica, Queens, New York city. This invention pro
videe a novel hande for exercisers, consisting of a han dle-bar having a frame upon which a finger-bar is adapt ed to slide longitudinally, the elastic cord being attacher to the bar. The handie-bar is held in the palm and the fingers are passed over the finger-bir. In operation, the
finger-bar will be alternately moved back and forth under finger-bar will be alternately moved back and forth under
the action of the cord and of the fingers. The device the action of the cord and of the fingers. The device possesses the merit of excrising the fingers as well as
the arm. the arm.
hand-stamp.-Menry h. harbivon, Manhattan, New York city. This invention provides a hand-stamp
for making reproductions from copying-ink, the printing surface being formed of a plastic or viscous compound mounted or run into the proper form and then permitted to set. The stamp has a body curved in the are of a circle and provided with a handle-bar running between its ends. so that the stamp may be held in the hand, and it arc-shaped printiny surface rocked over the surface to b printed, all of which provides a much more effective and be printed is laid down on a stationary printing pad
extension-table.-William R. Hallett, Hamarg, Ill. The inventor has devised a table provide with simple means for automatically raisiug the intermediate leaves into place while the table is beng ex-
tended, and for lowering the leaves while the table is being shortened. The table comprises two frames mounted slide one relatively to the other. To each frame to swing on the inner surface of one of the frames and are engaged by intermelliate leaves. Rock-bars hav cam ends engaging the plates; and from the rock-bars yielding tappets ext ind down and are engaged by a cros har carried by one of the frames
Ore-CONCENTRATOR. - Henry C. Grannatt are a series of slats pivoted at their lower edges, each having a riffle extending along its pivoted edge. The slats are placed in successively lower planes so that the extend from the feedung end of the slats a The riffle their length and are of successively greater length. The frume can be reciprocated longitudinally of the slats and the slats are simultaneously given a slight oscillation on their pivots. The device may be used in places where he supply of water is limited.
device for teaching music.-Johnson Morris, Marshall, Tex...The purpose of the inventor ha simple music in any key can be readily taught. The device comprises a modulator provided with column contaming characters indicating every semitone and tone
within the tonal compass of the modulator, and aloo pro vided with rows of hooks adjacent to the characters. tone-lader is provided with arms to engage the hook and to indicate the steps in the diatonic scales of the
characters in the columns. Independent arrows are provided to indicate the tones contained in any desire scale or chord.
SEA-Going Range-Finder.-John Donegan Cincinnati, Ohio. The range-finder comprises two tele scopes arranged in the same horizontal plane, one of the telescopes being pivoted to swing relatively to the othe turns in unison with the suxinging of the pivoted tele scope. The cylinder is provided with rows of numerals indicating distances which can be read by a longitudin ally-extending fixed bar. An indicator at the rear end of the cylinder indicates the row of numerals on the cylin der on which the distance is to be read. This indicato comprises a fixed disk having graduations correspondin on the disk in unison with the cylinder and pivoted tele on the
scope.

COMPOSITION OF MATTER.-Gustav T. Bruck present invention Is to provide a means whereby an oxy genated agent may be added to hydrogen peroxid in sufficiently large quantities to preserve the peroxid without producing the disagreeable and painful effec on the tiseues incident to the use of mineral aciids. To this end the inventor employs carbon dioxid, which
disappears largely at the time the peroxid is medicinally used, and is present in large quantities oniy so long as it preserving action is required.
STRAP-PROTECTOR--Edward G. A wcock, New harress is entirely independent of the strap to which is applied. The device is adapted for connection with buckle and for receiving a ring. snap, or other connecting medum between straps in a harness. The loop-atlach ment of a buckle to a strap need not be depended upon for security. The connections between the straps wil wear he
WRENCH.-Alexander Anderson, Greenville, Mise The novel leature of this invention is found in a pecu
liar nut, slidable on the shank wher in one position and locked against sliding when in another position, so that jaw in one case can be moved, while in the other on arranged that they cannot readily become disa ranged, and that they can securely grip, an object withou danger of the movable jaw's slipping or losing its hol concentrator. .- John c. and Richard Waters, Romley, Colo. On a vertically-sustained pivo be arms are attached to and extend oppositely fiom the head. A third arm is secured to the head, and ex-
arms a segmental table is mounted which is ad justably
supported at its outer edge. A curved trough is secure upported at its outer edge. A curved trough is secure nd a flange is located at one edge of the table adjacen adapted to discharge the concentrates, and the curved rough being adapted to receive the tailings.
COMBINED ADVERTISIN(-CABINET AND This device is designed for use in hotelels and other public places and is arranged to display advertisements of ectively and to contain books of ref erence. The bookcase used is provided with receptacles for books and hat
an advertising space at its front. Wings at the side of he bookcase are arranged for displaying adverisisens re connected by hinges with the sides of the bookcase. and are adapted to be swung forward or rearward int angular positions relatively to the bookcase. A cap for
he top of the bookcase is provided with advert sing the top
spaces.
mail-bagi--Louls Sanders, Brooklyn, New Yor city. This invention provides a mouth-controlling an outh-lock device which will effectually hoid the and which will also hold the month closed The me chanism at the mouth of the bag can le guickly op rated. A receptacle is also provided for the destination card, in which receptacle the card is automatically $r$ ained when the controlling mechanism is locked, and change-maker.-Peter P. Mcmenamin, Jersey City, N.J. This invention provides an improved change naker to enable cashiers and bartenders to make chang cuickly and enrecs whe paying out money possible the bills or coins of higher denomination. The change maker is provided with cells for containng stacks bottom coin from under the stack. Each slide is manu-
ally operated and is arranged to be moved independently any operated and is arranged to be moved independent| lly operated at the same time.
Shirt-bosom holider.-Charles L. Pashley tamford, N. Y. In order to secure the opposite edge
of a bosom to a vest so that the vest cannot spread and bend the shirt-bosom, the inventor provides a plate having prongs at oue end for attachment to the vest, and hook at the other end. The plate is extended inwardly rom the edge of the front opening. A loop eng
he hook is removably connected with the shirt. PACKAGE FOR INCANDESCENT-MANTLES. Henry Anealtzer, Manhattan, New York city. The upport for the mantle is secured. A supporting-b extends through a loop at the top of the mantle and ha
its ends sprung into the upper portion of the its ends sprung into the upper portion of the casing,
after which the casing is filled with collodion, alcohol, or ether. A mantle thus packed can be safely trans
orted. bating Process. - Henry Schlegel, Lapee re tauned, they are subjected to a "bating " process by which the lime is removed. Various acids have bee sed in the process, but bating has always require
nuch care and skill. The invent'r of the present proese secures a simple bate by employing a solution co sting essentially of potassium bichromate.
dustc-guard.- James S. Patten, Baltimore, Md The guard is composed of sections of sheet metal slida curved edges provided with integral bent portions forming eats for packing-strips. The guard can be cheaply co
tructed. The wearing parts can be readily renew FOLLOWER FOR PACKING BARRELS.- Norris M. Root, Masonville, N. Y. This invention provid ickles, fish, or the like, under brine in a barrel. The ollower used for this purpose is easily adjusted to the varying diameters of a barrel and has no metal parts corrode. The follower comprises a disk or plate having trips have longitudinal slots provided with notches in heir lower walls. Holding-arms and cross-heads on the rms project into the slots, one thickness of the portion of the cross-heads being substantially equal to the distance botween the walls of the slots, and the thicknees at right angles to the first-named thickness being greate

COPY-HOLDER.-Louis Hudgin, Lochiel, Arizona This holder rests on the desk of a typewriter and hold he copy in an inclined position over the machine and rectly in front of the eyes or the operator. It consist ieces which are fastened to the desk, and having two airs of hinged arms projecting out at an angle from in ront face, one pair being at the center of the frame and the second or shorter pair projecting from the top. ysted in postion. The copy-holer his besign with the eqpecial object of doing away with the n essity of fastening the device to the desk or machine.

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