Vol. XCVI.-No. 7 ESTABLISHED 1845. NEW Y●RK, FEBRUARY 16, 1907.

10 CENTS A COPY \$3.00 A YEAR.



A Photograph of the German Crown Prince Electrically Transmitted to a Distance of Nearly 1,100 Miles. The Small Picture, from Which the Enlargement Was Made, is the Actual Result Obtained With the New Method.

SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO. - Editors and Proprietors

Published Weekly at No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year, for the United States, Canada, or Mexico.......\$3.00 one copy, one year, to any foreign country, postage prepaid, \$0 16s. 5d. 4.00 THE SCIENTIFIC AMERICAN PUBLICATIONS

Scientific American (Established 1845) \$3.00 a year Scientific American Suspiement (Established 1876) 5.00 "American Homes and Gardens 3.60 "Scientific American Export Edition (Established 1878) 5.60 "The combined subscription rates and rates to retein countries will be furnished uson amplication.

e furnished upon application.

Remit by postal or express money order, or by bank draft or check.

MUNN & CO., 361 Broadway. New York.

NEW YORK, SATURDAY, FEBRUARY 16, 1907.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles short, and the facts authentic, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

GOVERNMENT REGULATION OF NIAGARA POWER.

· -- ------

The decision recently promulgated, under the Burton act, by Secretary of War Taft regarding government regulation of the utilization of the hydraulic power of Niagara Falls, has put a very effective stop to the alarming encroachments which the various power companies were making on the volume of the upper Niagara River, upon which the world-famous Falls depend for their scenic beauty. The decision allows the various existing companies on the American side to draw from the upper river volumes of water which are practically the same as those which are now utilized, and are permitted, as a maximum amount, by the provisions of the Burton act. The Niagara Falls Power Company may take 8,600 cubic feet per second, and the Niagara Falls Hydraulic Power and Manufacturing Company is restricted to 6,500 cubic feet per second. Power generated on the Canadian side may be imported in the following amounts: The International Railway Company, 1,500 horse-power; Ontario Power Company, 60,000 horse-power: Canadian-Niagara Falls Power Company, 52,500 horse-power; and the Electrical Development Company, 46,000 horse-power; making a total amount, which may be imported into the United States, of 160,000 horse-power. The Secretary of War may revoke these permits at his pleasure, and in any case, in the absence of any further legislation by Congress, they expire on June 29, 1909. Under these permits, there may be drawn from the upper river a total amount of 15,100 cubic feet per second on the American side, all of which is now being taken, and on the Canadian side they cover about 12,000 feet per second, of which last amount it is likely that about 5,000 cubic feet per second will be drawn during the three years covered by the permits. The volume of water passing over the Falls is estimated to be about 220,000 cubic feet per second; and as the total amount that will be drawn off during the coming three years is only about 20,000 cubic feet per second, it will be seen that the action of the United States government has effectively checked the desecration of the Falls, at least as far as American control of them is concerned, before it had proceeded to a point where the beauty and majesty of the Falls were seriously impaired.

Secretary Taft has done his work thoroughly; for not only is the further withdrawal of water to be prevented: but steps are to be taken to mitigate, if not remove, the unsightly conditions on the American side of the canyon below the Falls, the effect of which upon the sightseer is described as being that produced by looking at the backyard of a house negligently kept. A committee has been appointed to consider the question of restoring the American side of the canyon at this point, so as to put it once more in harmony with the Falls and other surroundings, and conceal, as far as possible, the raw commercial aspect that now offends the

STUPENDOUS WATER SUPPLY SCHEME.

e of the leading hydraulic engineers of the country have recently reported favorably upon what is probably the most daring municipal water supply scheme that has ever been projected. We refer to the proposal, which we understand has every prospect of being successfully prosecuted, to supply the city of Los Angeles and the surrounding district with an abundant supply of water drawn from the distant Sierra Mountains. The scheme involves, first, the construction of a conduit 226 miles in length, capable of supplying the city with a quarter of a billion gallons of water daily: second, the construction of large storage reservoirs, a single one of which will have the enormous capacity of 85 billion gallons of water; and lastly, the development of a total of 100,000 horsepower, available for six days of the week and nine hours of each day, the greater part of which can be developed within a distance of 45 miles of the city. The total cost of this very ambitious undertaking will be about \$25,000,000. The guarantee for planning this

work on a scale of such magnitude is to be found in the certain and very large income to be derived from the sale of water for irrigation purposes and for power, in and around a city which doubled its population in the ten years preceding the last census, and is recognized to-day as being, next to San Francisco, the most important commercial center in the flourishing State of California.

A SIMPLE-CYLINDER SUPERHEAT LOCOMOTIVE TEST.

An important question now being investigated by locomotive builders is the comparative efficiency of compound locomotives using high steam pressure and simple locomotives using low steam pressure There has now been in operation with superheat. on the Atchison, Topeka, and Santa Fé Railroad for over a year a simple-cylinder locomotive, which is identical with a class of compound locomotives operating on that road, in every particular except its cylinders, its boiler pressure, and the fact that it is provided with a superheater. The compound engines have tandem, compound cylinders, there being a 19-inch high and a 32-inch low on each side of the boiler, with a common stroke of 32 inches. The type was changed. in the experimental locomotive, by leaving out the 19-inch high-pressure cylinders (thus transforming the locomotive into a simple engine with two 32-inch diameter by 32-inch stroke cylinders), providing the boiler with a superheater, and lowering the pressure from $225\,$ pounds of steam to $140\,$ pounds, the superheater being built for the provision of 70 degrees of superheat. The locomotive started service with 130 pounds pressure, and this was successively raised to 135, 140, 145, finally to 150 pounds. The superheat ranged between 30 and 40 degrees. In spite of the failure to realize the expected 70 degrees of superheat, the locomotive has shown an efficiency within 5 per cent of that of the compound engines engaged in the same service. The record of this locomotive has been excellent, as is shown by the fact that it requires less repairs, and has been for a greater total time in service, than the compounds. Moreover, it is popular with the engineers, and by them preferred to the compound. not only because it requires less repairs, but on account of its adaptability to the water used on the division on which it has been working, which has the bad quality of excessive foaming. The absence of foaming is due to the drying-out effect of the superheater on the water carried over with the steam. The fuller data which will be available when the official report is made, will be awaited with no little interest. In this connection it should be noted that the value of superheated steam in locomotive service is to be investigated by Prof. Goss. of Purdue University, under a special grant of \$3,000 a year for four years from the Carnegie Institution.

ONE YEAR'S WEAR OF A STEAM TURBINE.

The economy of the steam turbine in certain classes of service is fully established. Its mechanical durability, however, is not so well known, and indeed the serious wrecking of the blades in some of the earlier machines had raised a reasonable doubt upon this point. Valuable testimony to the wearing qualities of the Parsons turbine, however, was recently given in a report, by the vice-president and manager of the operating department of the Baltimore Power Company, on the condition and performance of the turbines at the Gold Street car station, where the equipment consists of three 2,800-horse-power steam turbine units, the first of which was placed in service in July, 1905, the second in August, 1905, and the third in April, 1906. Recently the second unit was opened, after eleven months of more or less constant service, and a thorough examination was made. The machine was found to be, as regards its general condition, as good as when first installed; and although saturated steam had been used, .no blades were missing in either cylinder or spindle; nor was there any evidence of erosion, both edges of the blades and the steam surfaces of the same being intact. Furthermore, careful examination was made of the ends of the blades and of the inner surfaces of the cylinder which faced them and also of the surface of the spindle barrels facing the ends of the blades which project inwardly from the cylinder. In neither case was there the slightest evidence of contact or rubbing between the two. Mechanically, then, this turbine must be admitted to have fulfilled every expectation

As regards operation, the report states that the service rendered has been very satisfactory. The plant gives a twenty-four-hour service with a load varying from 12 to 15 per cent during week days, down to $\tilde{\mathbf{5}}$ to 8 per cent on Sundays. The turbines have shown that they are well suited to a high vacuum, no extraordinary trouble having been experienced in providing a vacuum within one inch of the barometer, particularly during cold weather. Notwithstanding the low load factor of 12 to 15 per cent, the station for one month averaged 3.36 pounds of coal per kilowatt hour generated, including all coal for banking and changing boilers, the coal being largely of bituminous mine cut-

tings. The corresponding water consumption of the station during the same month averaged 23.9 pounds per kilowatt hour. All of the condensed steam from the turbines is used for boiler feed water. During the same month the actual evaporation from a feed temperature of 180 deg. Fah. averaged 7.11 pounds of saturated steam per pound of coal. In concluding the report, the vice-president states that from an operating standpoint, steam-turbine motive-power equipment has proved eminently successful. It has been found to be entirely suitable for central station service, permanent in construction and adjustment, and economical of steam especially at low loads. Finally, the turbine plant is simple to operate, requiring less attention both skilled and unskilled than a reciprocating engine plant of corresponding size.

REINFORCED CONCRETE CONSTRUCTION ON THE PACIFIC COAST.

Already it is quite apparent that reinforced concrete is to enter largely in the reconstruction of San Francisco. There is scarcely a block in the downtown burned district that will not soon boast of at least one reinforced concrete building, for they are to be seen on every hand in various stages of construction. A five-story building on the corner of Geary and Market Streets, is the first structure of this kind to be occupied, while several others of from three to seven stories are in course of efection.

The most notable reinforced concrete building which has yet been announced for San Francisco is to be erected on the corner of Fourth and Market Streets, the site of the old Flood Building. It will be nine stories high and will cost \$1,000,000. Its exterior, for the first two stories, will be veneered with ceramic tile in rich browns. Above the second story the entire front will be faced with cream-colored glazed terra cotta in rich detail. The corridors and lobbies will be finished in imported marbles, and six electric highspeed elevators will be installed. One remarkable feature of this concrete structure is the fact that nine stories are made possible within the limit of height to which concrete buildings are restricted by the city ordinance—one hundred and two feet. The first story will have a height of twenty feet; the second, twelve feet: and the other stories, ten feet each. By an ingenious arrangement of the structure, the fact that the roof is of concrete makes it possible to dispense entirely with an attic story.

The concrete firms declare that no other construction will stand fire and earthquake as well as reinforced concrete: and according to investigations made by the California Promotion Committee, it would seem that the facts bear out this assertion. It is well known, for example, that the museum at Stanford University was built seventeen years ago of reinforced concrete, being the first building of its kind in California. As compared with our modern methods, it was a very crude example of reinforced concrete construction. Nevertheless, it stood the earthquake admirably. One statue was thrown from the top, and all the marble statuary in the interior was toppled to the floor and broken. The pictures on the walls were swung with their faces toward the wall. However, the building sustained no damage, not even being cracked in the slightest extent. The girls' dormitory was also of concrete construction except in the roof. The roof was badly damaged, but the remainder of the building was only slightly in-

In San Francisco, the Bekins warehouse was constructed with brick walls, and reinforced concrete for all other parts, such as floors, girders, and interior columns. This building sustained practically no damage either from fire or earthquake. At the time of the quake the building was under construction, and but two stories had been completed. The first story had already been filled with inflammable merchandise. which was entirely consumed. The building was not damaged in the least.

There were many other buildings in San Francisco having reinforced concrete floors. The National Board of Fire Underwriters' report of the San Francisco disaster shows that less than five per cent of these reinforced concrete floors were damaged.

In the Baltimore fire there were two buildings of reinforced concrete in the hottest part of the conflagration. One of these was five stories high with brick walls, and all the interior construction of reinforced concrete. The brick walls were destroyed by the intense heat, leaving the entire interior construction standing, with the full five stories practically undamaged, and requiring only the outer walls to be replaced to fit the building for use. The other building was a bank. The first two stories were of reinforced concrete construction, with three stories above of brick and timber. The upper stories were entirely destroyed, heaping great piles of debris into the top of the two concrete floors. The two concrete stories suffered no damage, not even the woodwork being burned.

In Los Angeles, reinforced concrete has been more extensively used than in any other city in the United States up to the present time. The immense Audi-

torium Building, which has just been opened with a season of grand opera, is unique in many ways. It is noted for three features which have never before been undertaken in reinforced concrete construction—a concrete roof construction, a great balcony overhang, and cement girders carrying extraordinary loads. The balcony was loaded with a test load of 680 pounds to the square foot and, as the overhang is 31 feet, it was expected that the deflection would be considerable. As a matter of fact, it was only one-twelfth of an inch on the front. Great trusses were used in this building, 112 feet in height, with a depth in the center of 11 feet. When the false work was removed, they showed so little deflection that it was hardly measurable. With an applied load of 100 pounds to the foot, they showed a deflection of only an eighth of an inch. The girders make a span of 42 feet and have a depth of 63 inches. They carry a concentrated load of 100 pounds to the foot, the center load being a concrete column running through five stories and an attic. While greater spans for bridge work have been executed in reinforced concrete, no roof construction has ever been attempted before that approaches this in magnitude. It suggests the wide range of application of reinforced concrete construction, which, although it is extending so rapidly, is still in its infancy.

THE ODORS OF METALS.

The statement found in most treatises, that metals are inodorous, is contradicted by the most elementary daily observation.

According to experiments recently made by Herr C. Gruhn, of Berlin, the mechanism of smell, at least in the case of metals, is, however, entirely different. The following account of these researches will even show the very general interest attaching to this problem. He found that a piece of old metal (copper, aluminium, tin, zinc, iron, lead, etc.) at ordinary temperatures possesses a slight smell which many persons are unable to detect. The same piece of metal having been heated above a lamp to a moderate temperature is found to give out a very strong smell, which is readily distinguished by any one. From experiments so far made, it would seem that the condition (either pure or oxidized) of the surface of the metal does not exert any influence on the quality or intensity of this smell.

If a piece of metal be heated during some length of time (about an hour), its temperature being kept constant, it at first gives out a very strong smell, which, however, gradually decreases in intensity, until it is just equivalent to the smell given out in the cold state. If, however, the heating be discontinued and the metal cooled, it no longer shows the least trace of smell. Another heating effected immediately afterward will produce only a feeble smell; the metal thus appears to have become well-nigh exhausted.

If the same increase in temperature be imparted to another sample of the same metal, the stronger effects of the fresh metal become specially striking. These phenomena always occur in exactly the same manner.

Gruhn infers that the matter vaporized during the heating is not identical with the metal itself. In fact, it would be difficult to understand why the vaporization of the metal should eventually cease in the case of a prolonged heating. It certainly could be objected that a prolonged heating would result in the production of an oxide layer at the surface of the metal, putting an end to vaporization. The experiments described, however, show that a layer of oxide in no way interferes with the emission of smell from a heated metal

The phenomena described in the following experiment afford a very striking evidence of Herr Gruhn's hypothesis. A piece of metal having been deprived of its smell and kept in the cold state during two to three hours, is heated anew. It is then found to have been restored to its previous power, smelling as strongly as a fresh piece of metal. This experiment can be repeated over again with the same success any number of times.

It should be remembered that the temperatures involved are by no means excessive, a temperature of 122 deg. F. being quite sufficient. In fact, a fresh piece of metal will give out a rather strong smell even on being heated through 40 to 50 deg. F.

From these experiments Herr Gruhn draws the conclusion that the metal continually gives out an emanation of gaseous matter, composed, not of atoms of the metal, but rather of a product of transformation from these atoms. The metal possesses the power of storing this odorous matter in the same way as carbonic acid is stored in water. To each given temperature corresponds a maximum amount of odorous matter which the metal is capable of retaining. The metal thus becomes saturated. A voluntary prolonged cooling should accordingly result in a more copious accumulation of odorous matter in the metal. This is really borne out by Herr Gruhn's experiments.

The experimenter has finally succeeded in separating and isolating in a vessel the odor given out from a metal, which thus behaves in exactly the same way as the emanations of radioactive bodies.

The odoriferous phenomena described are probably not characteristic of metals only, but are shared by all bodies, and being perfectly analogous to radioactive phenomena, point to the existence of some universal law.

Radioactive salts are known likewise to give out spontaneously and continually an emanation of gaseous matter that in a similar way is driven out by heat, only to be incessantly reformed during a prolonged rest in the cold state. While the radioactive emanation is gaged by the ionization of air, the odorous emanation of metals is gaged by the nose. The various radioactive emanations have been found on the other hand to undergo multiple conversions, eventually passing into a stable condition, as illustrated by the chain of conversions leading from radium to helium. In view of the universal analogies exhibited by the laws of nature, the odors of metals are likely to pass through a similar series of transformations as radioactive emanations. There is no reason for supposing that the electroscope, which has rendered such excellent service in detecting radioactive substances, will suffice for perceiving all emanations that may be discovered in the future. It will rather be the task of science to look for ever-new reagents enlarging our perceptive faculties. Such a means of extending the scope of our senses is for instance the torsional balance, by means of which Herr Gruhn has been able to ascertain the existence of peculiar emanations in the atmosphere.

AERIAL NAVIGATION PRIZES.

Of a somewhat sensational nature is the announcement of a \$50,000 aeronautic prize offered at Paris. The prize in question is to be awarded for an aerial flight from Paris to London, and the largest part of the sum is subscribed by one of the leading daily journals, Le Matin, which offers \$20,000. The remainder is subscribed in equal portions of \$10,000 by Marquis de Dion, M. Clement, and M. Charley, all three of whom figure prominently in the automobile world. According to the rules which have already appeared regarding the contest, the event will take place in 1908 and there are two essential points, first, that all possible kinds of aerial craft are admitted to the contest, and second, that the motors employed on all the flying machines must be of French construction. The aeronauts themselves may, however, be of any nationality. In any event, not regarding the state of the atmosphere, the start will take place from Paris on the 14th of July (the national holiday), 1908. Should the \$50,000 prize not be won at that time, other starts will be fixed for the second Sundays of August, September, and October so as to have the event closed in the year 1908 if possible. The distance is 212 miles.

The amount of the prize will be awarded directly by the donors to the proprietor of the winning flyer who arrives the first within a maximum period of twentyfour hours exclusively through the air and using only the power contained within such apparatus. For the start a point will be fixed in or near the city at a later date. The finish will be noted by the dropping of a marked bag from the flyer, which is to fall within a circle of 25 meters (82 feet) radius about the finish point. Ten o'clock in the morning is the hour fixed for the start. It is to be noted that stops en route are to be allowed for taking on fuel and other supplies. All the motors are to be of French make. Closing of the engagement lists will take place thirty days before each start. No competitors will be allowed to enter who have not made a good performance beforehand with their aerial flyers, according to the testimony of reliable persons. Questions which are not settled by the regulations may be brought before the committee for decision, and this will be final. The announcement of such a large prize has awakened a great interest, as may be naturally expected, in aeronautic circles in Paris and elsewhere, and it will go far toward stimulating the activity of aeronauts, especially in France.

When the Daily Mail offered the sum of £10,000 (\$50,000) on certain conditions for an aeroplane flight from London to Manchester, The Car, a London automobile paper, offered through the medium of the Daily Mail £5 (\$25) per mile with the low minimum of twenty-five miles to be covered, and a challenge trophy value of 500 guineas (\$2,500) for the longest flight taken in Great Britain in any one year.

The Brooklands Automobile Racing Club, of England, offers a money prize of £2,500 (\$12,500) for any aeronaut who wins a race in the air by covering the prescribed course once. The date of the race will probably be in June or July next, so as to give plenty of time for construction and experiments. The prize will be given to the owner of any aeroplane, heavier than air, which completes the circuit of the Brooklands motor course (a three-mile track 100 feet wide) without touching ground from start to finish, at an altitude of between 30 and 50 feet, or thereabout, from the surface of the track. This offer is open from the day of the public opening of the motor course until December 31, 1907. A condition is that Edwin Rodakowski, a member of the club, must be given three weeks' notice of an intended attempt to compete, and

that the date selected must not clash with any date of racing fixtures. Accommodations for aeroplanes wishing to compete will be provided free of charge.

It has been decided in addition to the above stipulations that the airship must cover the three miles of the course in not less than eighteen minutes, or at the minimum speed of ten miles per hour.

The track, or a portion of it, will be placed by the club at the disposal of those who wish to experiment on certain days in each month, beginning probably in May next.

Prizes for model aeroplanes weighing not over 50 pounds have been offered by the Aero Club of Great Britain for a competition to be held the first part of April. These machines must be able to fly a short distance under their own power. The first prize is \$750, and there are two other prizes of \$500 and \$250 each.

Among the prizes offered for aeroplane flights abroad is a new \$40,000 prize for a flight or race from Ostend to Paris. This prize was recently offered by the manager of the Ostend Kursaal, and it is open to both aeroplanes and dirigible balloons. Sunday, the 10th of August, is the date set, and all Sundays in succeeding Augusts till the prize is won. The distance is about 175 miles, and it must be covered within twenty-four hours.

SCIENCE NOTES.

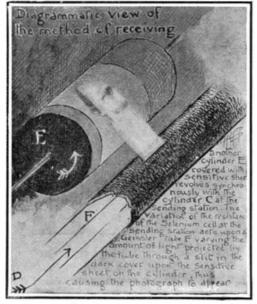
The soapberry tree, Sapindus marginetus utilis, has been quite extensively cultivated in Algeria for its berries, which are rich in saponin, and are sent to Germany for use in the manufacture of soap. Similar qualities are possessed by the Florida soap tree, Sapindus manatensis utilis, commonly known as the China soap tree, from the fact that it was originally introduced from China. Mr. E. Moulie, of Jacksonville, Fla., has recently been engaged in promoting the cultivation of this tree in the Southern States by a free distribution of seeds. The tree grows to a height of forty or fifty feet and begins to bear fruit in the sixth year. The berries are about the size of cherries and consist of a hard, yellow-brown wax-like shell, inclosing a large black seed. The shell is rich in saponin, and if bits of it are agitated in water a lather will at once begin to form. By grinding the shells a brownsh soap powder is obtained which possesses valuable cleansing properties. The hard, black seeds of the soapberry tree have been used in the manufacture of beads; they also yield a fine oil useful in soap manufacture, as well as in other industries.

As the London Exhibition of 1851 was the time in the middle of the century when technical education began, so the World's Columbian Exposition at Chicago in 1893 marks the beginning of that educational technical movement of which we are now a part. During the last decade advancement has been phenomenal and the demand for technical education never was so great as at the present time. Never has greater attention been given to the subject. England is thoroughly alarmed at the possibility of losing her commercial supremacy. At the organization of the Municipal Technical School of Manchester a committee was sent to the Continent and another to this country to investigate the subject of technical education. Besides individual educators and members of Parliament who have come here, the Mosely delegation of thirty British workmen made an exhaustive study of the industrial situation and technical education. Educators from Norway, Sweden, Russia, France, Switzerland, and Germany have also been attracted to the United States by the remarkable progress we have made. While the presidents of literary colleges are spending much of their time in "stumping" the country, like so many politicians, advertising the advantages of their colleges and making frantic efforts to increase their attendance, the enrollment of the technical schools has been steadily increasing, without pomp or bluster, more rapidly proportionately than the enrollment in high schools, colleges, or universities, and even faster than population. In the South there is clearly apparent an awakening sense of the necessity of more technical skill to develop her resources. The introduction of textile schools, and the application of technical arts in the education of the negro are only forerunners of a great movement for more extended work in other lines. The farmer in the West has learned that the agricultural schools and experimental stations connected with the State universities are of an economic advantage to him and his sons. Mining industries have found that schools of mining engineering, located at convenient centers, are beneficial in supplying their need of trained engineers and metallurgists. The increase of manual training schools in all parts of the country is so rapid that it is difficult to find a supply of well qualified instructors. During the past decade the technical school in the United States which has not largely increased its enrollment, its equipment, and buildings, is decidely the exception. This tendency toward technical education is full of meaning to those who are studying the industrial development only in the educational aspect of the move-

KORN'S PHOTOGRAPHIC FAC-SIMILE TELEGRAPH.* BY ROBERT GRIMSHAW.

The following information was obtained in an interview with Prof. Korn, of Munich, the inventor of one of the latest systems of electro-telephotography, or of reproducing electrically, at a distance, photographic images.

As far back as 1901 the professor made more or less successful experiments in transmitting electrical-



The Receiver of 1903.

D. Wire from transmitter; F, Geissler tube; E, cylinder with film for receiving the image.

ly to a distance, simple figures and signs, by means of specially-constructed sending and receiving apparatus. The picture to be transmitted was placed in a glass cylinder which was constantly rotated and also simultaneously moved in the axial direction, and which was illuminated by light rays passing through a small opening in a metal casing surrounding the glass cylinder. The source of light was a Nernst incandescent lamp, the rays from which were totally deflected by a prism on to a selenium cell, which has the property of changing its electrical conductivity under the action of light rays of varying intensity. The more strongly the cell is illuminated, the greater becomes its electric conductivity, and vice versa. In the receiving apparatus, which was electrically connected with the sender by a telegraphic or telephonic line, the occurrences were similar to those in the sender. The light, which varied in its intensity, was admitted through a small opening in the casing of a glass cylinder containing a sensitive photographic film, and which had axial and rotatory movements similar to and synchronous with the cylinder on the sender. This effected on the sensitive receiving film a reproduction of the picture on the photographically fixed film in the sender. The greater the intensity of the electric current received, the greater the light emitted by the electric incandescent lamp of the receiving apparatus, and vice versa. The most important operation here was the absolute synchronism of the two cylinders-that of the sender and that of the receiver

Whereas with the earlier apparatus a picture 5.2 inches by 7.2 inches could be electrically transmitted and photographically reproduced in about 15 minutes,

property of selenium, that it is not only sensitive to varying intensities of light in its electric conductivity. but is also affected thereby in its resistance. The combating of this undesirable property is effected by a compensator, in the shape of a second selenium cell in the receiver, that has the same degree of sensibility to light and corresponding conductivity to electricity as that in the sender, and its mate in the receiver, but in the opposite direction, so that in its variations, no matter how long they may continue, it practically counteracts all error, and thereby obviates delay. In this manner, as well as by replacing the former needle galvanometer by one of the chord type, it is possible, first of all, to shorten the time required for transmission, and in the second place to obtain, furthermore, much clearer pictures in the receiver.

The times given as necessary for transmission are naturally only for overhead conductors. Such rapidity is not attainable with submarine cables, by reason of their greater capacity.

The professor exhibited two pictures, one of the German Kaiser and one of himself, that at a distance of a yard were hardly to be distinguished from ordinary photographs, and which, the professor stated, had been transmitted through a resistance corresponding to 1,800 kilometers, about 1,080 miles.

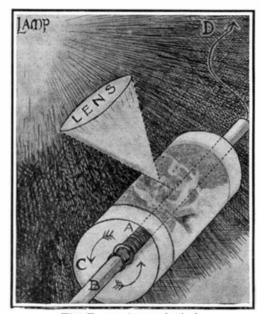
As regards the practical utilization of the invention, the professor stated that its application for purposes of crime detection would prove of the greatest value. The illustrated press has also naturally shown a great interest in the invention, and some of the European publishers have already made arrangements to use it. L'Illustration of Paris has purchased the sole rights for France up to July 1, 1909, after which these rights will revert to the inventor. That journal has the right to install sending apparatus in every country, and a receiver in Paris. The apparatus may be made by French manufacturers. For Germany the inventor has reserved all rights, and the apparatus will be made by a German firm. English journals show special interest in the matter, and both the Daily Mail and the Illustrated London News have taken steps toward the purchase of the English rights, but up to date the inventor has closed no contracts with them. in the expectation that an international company will shortly be formed.

When the German Kaiser was in München, Prof. Korn had made preparations to show him the apparatus and its workings; but the directors of the German Museum decided that the time would be too short, and the exhibition was not made. But the Kaiser manifested much interest therein, and ordered Prof. Slaby to give an explanation of the apparatus and its manner of working; this the latter did on November 27. In Paris, on the 3d of December, Poincaré read a paper on the subject of the selenium compensator and the new method.

In the spring there will be installed in Berlin and in some other important city, at a considerable distance therefrom, the apparatus for demonstrating on an actual working scale not merely the possibilities but the absolute practicability of the invention.

We illustrate herewith the really extraordinary results that Prof. Korn has obtained. As said before, the possibility of this remarkable electrical mechanical feat is due to a peculiar property of the metal selenium which can translate variations of light into concomitant variations of an electric current. Just as the diaphragm of a telephone causes the mechanical vibrations of sound to be reproduced in corresponding elec-

an outer metallic cylinder, and an inner cylinder of glass, on which is fixed the photographic film to be transmitted. The inner cylinder is made to revolve, and as it does so it passes an aperture in the metal cylinder, through which comes a focused beam from a Nernst lamp. This beam passes through the photographic film and thence to a prism, from which it is deflected to a plaque of selenium in the electric circuit. The variations of the revolving image are thus made to play upon the selenium, and are reproduced in the



The Transmitter of 1903.

A. Selenium cell; B, axis; C, glass cylinder carrying photo-film to be sent

electric wave passing through the selenium. The receiver consists primarily of a camera in which is another revolving cylinder carrying a sensitive film which is to receive the image. Through an aperture in the end of the camera comes another beam from a Nernst lamp which has previously been focused upon a Geissler tube. The tube (G in the diagram) is in the electric circuit, and the variations of the current are thus retranslated into variations of light, which, playing upon the sensitive film, set up the second image.

The period from 1840 to 1850 witnessed the establishment of commercial grape culture in the United States. A beginning was made in the manufacture of choice wine from American grapes on the Atlantic coast, the choicest Vinifera varieties were introduced on the Pacific coast, and wine made therefrom showed the pioneers of California that they could at no distant date enter into direct competition with Europe in the production of the choicest wines on the globe. It is to be regretted that so many of the fine wines produced have been sold under foreign labels of late years, there being but few of the better firms that have striven to make a reputation on their choicest wines, and the catering of the heaviest distributers to the cheaper trade has resulted in eliminating, to a very great extent, the growing of the better, less productive varieties of grapes; hence, a tendency toward producing quantity at the expense of quality. In 1850 the country produced 250,000 gallons of wine. In 1860 the product had reached over 1,500,000 gallons, and all the States and Territories, except four, were grow-

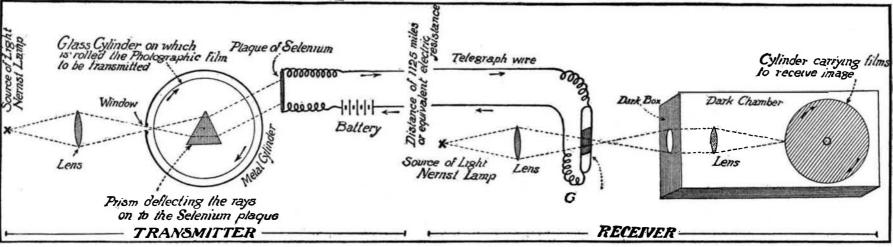


Diagram Showing the Working of Prof. Korn's Latest Apparatus for Transmitting Photographic Images.

A PHOTOGRAPHIC FAC SIMILE TELEGRAPH.

recent improvements have reduced the necessary time for transmission and reproduction to from 6 to 12 minutes only; and as far as shortening the time for transmission is concerned, there seems at present to be no limit.

The recent improvement is in the direction of doing away with, or of neutralizing, the undesirable

*The pictures on this page are reproduced by courtesy of the Illus-

tric vibrations, so the action of variable light upon a plate of selenium, through which a current of electricity is passing, will cause that current to vary in exact accordance with the gradation of the light modified by a photographic film.

The apparatus will be best understood from the accompanying diagram. Like a telegraph or a telephone, there is at one end a transmitter, at the other end a receiver. In its simplest form the receiver consists of

ing grapes. The census of 1860 showed California, New York, and Ohio as the three leading wine-producing States. From 1860 to 1875 rapid progress was made. In 1870 Missouri produced more than any other State except California. With this exception, California, New York, and Ohio have been in the lead. According to the last United States census (1900), twelve States reported having over 2,000,000 vines each in bearing.

THE CAR FERRY TRAFFIC OF LAKE ERIE. BY W. FRANK M'CLURE.

Winter navigation on Lake Erie between the coal shipping ports of Ohio and Canadian harbors, 60 miles across, has long been a problem. For more than a decade, Lake Erie car ferries have attempted to run uninterruptedly the year round, but time and again in late winter are overtaken by ice conditions which result in their being frozen in for weeks, sometimes a mile or more from shore. Nevertheless the car ferry traffic of this notable inland body of water is a success and is increasing. A new ferry, with novel features for ice battling, of which great things are expected, has recently been put into service, and it is reported that another large ferry is to be built next year.

The navigation season for ore vessels on the lower lakes closes during the early part of December. After this time business at the docks is suspended except for the loading of ore from stock piles into railroad cars bound for the furnace districts, and the loading of coal, steel, and other freight to the car ferries. There is a constant demand for American coal on the Canadian side and, as to the supply, it is more plenti-

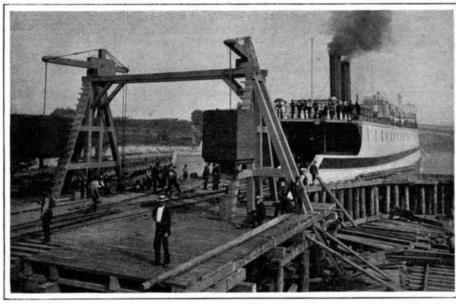
in the strict sense of the word, since, while the cars are run aboard via two tracks, they are not carried across the lake but discharge their contents from hopper bottoms into a continuous hatch over which the tracks are suspended. Ten cars at one time can be unloaded in this manner. The capacity of the hold is 2,500 tons. At the Canadian terminal four grapple unloaders remove the cargo in eight hours. The time of unloading, of course, is much longer than that of a ferry which carries the loaded cars, but the load carried is several times as great and the time of loading is but little more than that of the regular car ferries. The length of this vessel is 255 feet, depth 22 feet, beam 43 feet.

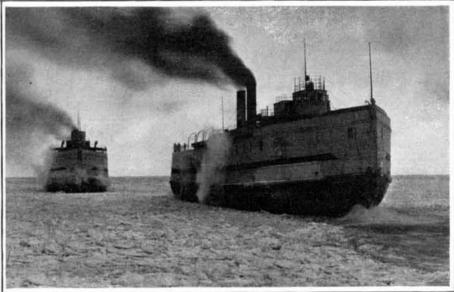
The new car ferry "Ashtabula," for which this is the first winter, is notable especially for her water bottom, which is so controlled that she can free herself from the ice in several different ways, dependent upon the kinds of ice with which she has to battle, or other conditions. There are eight transverse bulkheads, six of which run to the car or main deck and two to the lower deck. The water in the compartments is controlled by ballast pumps. Simultaneously one pump

In a cabin amidships are the galley and the eating quarters of the ferry. The dining room for officers and guests is elaborately furnished. There are also baths, lavatories, and all modern conveniences. Even the quarters of the deck hands are equipped for comfort. The vessel is lighted by electricity and, when in port, is connected with the telephone service. She was built at the yards of the Great Lakes Engineering Company at Detroit.

The ferry can make two trips a day between Ashtabula and Port Burwell. Her actual running time for the round trip on her official test was nine hours and twenty-five minutes. Going to Port Burwell with a full load of thirty cars of coal, and with the lake quite rough, she made a little more than 15 miles an hour and returning averaged 15¼ miles per hour.

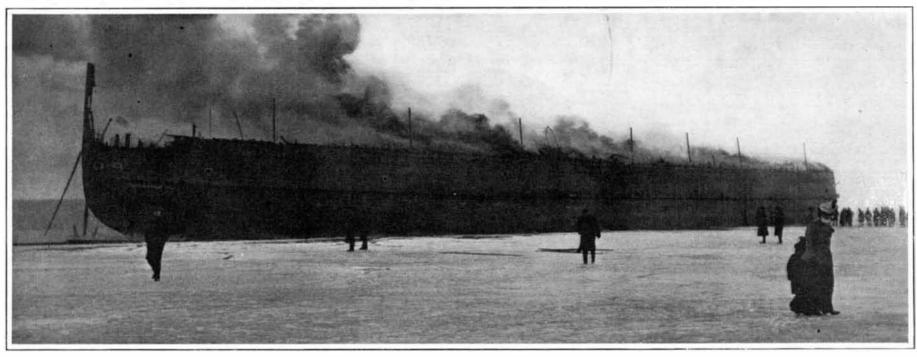
The method of loading and unloading a car ferry calls for an apron which can be raised and lowered, and which is equipped with tracks which will connect the tracks of the docks with those on board the ferry. This apron hangs from powerful balance arms, from the opposite ends of which are counter-weights aggregating 40 tons. This lift is controlled by electric ma-





The Apron of a Car Ferry Dock, Showing Counterweights Used in Its Operation.

Car Ferries Crossing Lake Erie Through Fields of Ice.



A Burning Car Ferry Caught in the Ice Off Conneaut Harbor.

THE CAR FERRY TRAFFIC OF LAKE ERIE.

ful in winter for these routes than in summer, when large numbers of vessels are waiting for cargoes for the upper lakes.

One of the car ferry routes of Lake Erie extends from the port of Conneaut, Ohio, to Port Dover, Canada. Other Canadian ports which are reached from Conneaut are Port Stanley and Rondeau. The latest route on Lake Erie is one which has been inaugurated during the past year between Ashtabula, the world's greatest ore receiving port, and Port B'urwell, in the Dominion. Any of these routes compares favorably in length with the notable ones of Lake Baikal, which connect with the Trans-Siberian railway.

The first two ferries introduced on Lake Erie were each 300 feet long, 54 feet beam, 60 feet high from keel to deck, and equipped as 3,500-horse-power ice crushers. The number of cars which could be placed aboard was from 26 to 30, depending on the size of the cars. The ice crusher, located at the bow and shaped something like a spoon, climbs up onto the ice in its path and crushes it down.

In 1904, another type of ferry—the "Marquette & Bessemer No. 1"—was placed on a coal route between Conneaut and Rondeau. This boat is not a car ferry

may be pumping the water out of one compartment and another pumping into another compartment. By filling the tanks aft and pumping out the ones forward, the ferry's bow is made to climb up on to a field of ice and crush it down in its path. To plow directly into a field of ice, when traveling light, the vessel is lowered to the desired depth by filling all the water compartments. Again, in freeing herself from ice, it may be deemed best to list the ferry to one side. This is accomplished by filling the tanks on one side of the ferry and pumping out those on the other.

This ferry is 50 feet longer than the ones on the Conneaut-Port Dover line heretofore referred to, and has a 56-foot beam. Her keel is 330 feet, her depth 20 feet. She is propelled by twin screws, driven by two triple-expansion engines with cylinders 19½, 31, and 52 inches diameter by 36-inch stroke, supplied with steam from four Scotch boilers.

On board the car ferry "Ashtabula" there are four tracks. These tracks will accommodate thirty 50-ton cars coupled together and then fastened to bumper posts. New cars have been built especially for this ferry traffic. They are each 38 feet long.

chinery. With the touch of a lever, the outer end of the apron can be raised or lowered to the level of the vessel's dock, the inner end working on rockers. The apron at the Ashtabula car ferry dock weighs 75 tons and is 30 x 52 feet in size. There are usually four tracks on the dock, four on the ferry, and two on the apron. The cars go to and from their respective tracks by switching. Two of the tracks in the car ferry yards are kept for empty cars and two for loaded cars. The switching of loaded cars aboard and empty cars to shore may progress at the same time. At the Canadian terminals, when switched to the docks, the cars are picked up by the Canadian railways and distributed to distant destinations for unloading.

Lake Erie car ferries in starting out upon a one-day trip, in January and February especially, take with them a stock of provisions sufficient for at least three weeks. This is to provide for an emergency in case the ferry is frozen in on the route. When frozen in, members of the crews often walk to and from the mainland over the fields of ice. It was while thus stuck in the ice that the destructive fire shown in the accompanying photograph took place off Conneaut. This was some two years ago. The ferry burned was

"Shenango No. 1," which ran between Conneaut and Canadian ports.

The wind has a great deal to do with the ice conditions, often piling the ice up mountains high in the ferries' path. In such cases, if an opening can be found in the windrows, the ferry may break through. Otherwise, dynamiting is sometimes done with good effect

THE BATTLESHIP OF THE FUTURE.—II.

BY FORREST E. CARDULLO.

(Continued from page 133.)

In the case of large guns, the most effective caliber of weapon is the minimum caliber which will give the requisite penetration at probable battle ranges. The greater the weight of a gun, the less the number of hits which it will score in a given time. The greater the weight of a gun, the less the number of them which can be carried on a given displacement. Two shells of 1,000 pounds weight each will have more destructive effect than will one shell of 2,000 pounds weight, provided that they have sufficient penetrative power. From these several considerations, it becomes apparent that a large number of guns of sufficient caliber are much to be preferred to a smaller number of larger guns.

There is reason to believe, however, that the weights of projectiles of given calibers will be increased. If a number of projectiles of different weights be fired from the same gun with the same powder charge, all will have the same muzzle energy. The lighter ones will have the higher initial velocity, the greater penetrating power, and will experience the greater air resistance. On account of this resistance, the velocity, the striking energy, and the penetrating power of the lighter projectiles will fall off much more rapidly than is the case with the heavier projectiles, so that at the longer ranges, the advantage lies entirely with the latter. Let us take for example a 12-inch gun firing 800, 1,000, 1,200, and 1,400-pound projectiles, as shown in Table I. At the muzzle, and at 3,000 yards range,

 $\begin{array}{ccc} \textbf{TABLE I.} \\ \textbf{Length of gun, 50 calibers.} & \textbf{Powder pressure, 21 tons per sq.inch.} \end{array}$

Range, yds.	3,0	000	6,000 9,000			12,000			
	. -		P.			v.	·	- ·	_
C. G. S.	V. P.	.—	-—	v. —-	P. -—		·	<u> </u>	P.
		3030 2790 2600 2440	25.8 25.2 25.0 24.5	2520 2390 2280 2180	20 0 21.0 21.0 21.0	2060 2030 1990 1940	14.6 15.2 16.7 17.4	1670 1720 1730 1720	11.0 12.6 13.8 14.5

TABLE II. Length of gun, 60 calibers. Powder pressure, 17 tons per sq. inch.												
8 10 12 14 16	124	300 580 1000 1600 2400	3160	19.5 25 5 30.5 35.6 41.0	2540 2670 2730 2790 2840	14.4 20.0 24.6 29.5 35.6	2010 2230 2340 2460 2540	10.4 15.0 19.0 24.5 26.6	1560 1840 1990 2150 2 26 0	77.2 11.5 15.6 19.0 24.8	1222 1510 1680 1870 2010	5.8 9.0 12.0 16.3 20.8
Len	Length of gun, 50 calibers. Powder pressure, 27 tons per sq. inch.											
8 10 12 14	23 45 78 124	350 700 1200 1900	3300 3300	24 0 30.0 36.0 42.0	2760 2860 2940 2980	18.4 24.2 30 0 36.0	2260 2 _± 60 259 2680	13.6 19.3 25.2 30.7	1830 2100 2280 2400	10.0 15.2 20.4 -6.0	1480 1780 1990 2140	7.2 11.9 17.0 22.0

In these tables C represents the camper of the gun in inches, G the weight of the gun in tons, S the weight of the shot in pounds, and V and P the velocity in foet seconds, and the penetration of Krupp armor in inches respectively at the range given.

the lighter projectiles have the higher velocities, and the greater penetrations. At a little less than 6,000 yards range, all the projectiles have practically the same penetration, but the lighter ones are preferable, since they give the flatter trajectory, and will also score more hits for a given weight of ammunition carried. At 9,000 and at 12,000 yards range, it may be seen that the 1,000-pound or the 1,200-pound projectile is preferable, the greater penetration of the latter being offset by the flatter trajectory of the former.

A comparison for all the ranges shows that the

1,200-pound shot gives the best average results, and is the one that should probably be adopted for this particular caliber and muzzle energy. For a greater muzzle energy, both the weight of the shot and the muzzle velocity should be increased, if we are to secure the most effective service from the gun. It may be stated as a general rule that the weight of projectile should

be so adjusted to the caliber and power of the gun that the remaining velocity at the longest probable battle range shall be a maximum. This principle will necessitate an increase of from 20 per cent to 40 per cent in the weights of projectiles of given calibers.

Table II. gives the ballistics of two series of guns such as we may expect to see on the battleship of the future. An inspection of this table develops the fact that a 14-inch gun is probably as large as will ever

be mounted on shipboard. The 16-inch gun weighs 50 per cent more than the 14-inch gun. Twelve 14-inch guns would be more effective than eight 16-inch guns. since they would fire twice as many aimed shots per minute, each of which is practically as effective as one from the larger gun. Both shells will penetrate any armor likely to be afloat for some time to come, at 9.000 yards range. The 16-inch shell has the advantage when employed against very heavy armor at more than 9,000 yards range, but this is not sufficient to counterbalance the advantages of the 14-inch shell at more practical ranges. Whether or not the 14-inch gun shall establish itself as the standard primary weapon is not clear from the table. The use of vanadium, or possibly some as yet undiscovered element, in the manufacture of armor may confer upon it such resistant qualities as to make the adoption of a 14-inch gun advisable, or changes in the propelling machinery may make the adoption of much thicker armor possible, but if neither of these possible events comes to pass, it is probable that the 12-inch gun will remain the most powerful naval weapon.

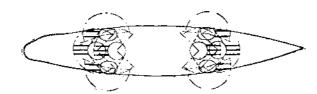


Fig. 7.—Twenty 12-Inch Gun Battleship. Two Groups, Each Containing Two 3-Gun and Two 2-Gun Turrets.

The proportion of weight which the modern designer devotes to armor is about 25 per cent. On the battleship "Connecticut" this gives us the equivalent of 12-inch armor over the vital parts of the ship. If the proportion of weight and distribution of armor remains the same, the thickness of the armor will vary as the cube root of the displacement. We should therefore expect a 20,000-ton ship to have 13 inches of armor, a 25.000-ton ship 14 inches of armor, and a 30.000-ton ship 14% inches of armor. None of this would be safe against guns of 10-inch caliber or over, at 6,000 vards, and the tendency will be to thicken it when possible. This may be done either by increasing the proportion of weight devoted to armor, or by reducing the area of the thin armor covering the non-vital upper works. The last method is far the best. If we increase the proportion of weight devoted to armor it must be done at the expense of gun power. Any armor that can be made can be penetrated at some range, and our heavily armored ship may be attacked by a ship of thinner armor and superior gun power, and destroyed at short range where its superior armor is useless. At the same time, armor is necessary, for if a ship be unarmored, it would be quickly destroyed at long range by an armored vessel, while its own guns were powerless to inflict damage. There is a golden mean in the matter of the thickness and extent of armor carried, which will give the most powerful ship for the given displacement, and it will probably be found somewhere about as indicated in Table III.

In arranging the distribution of armor, the principle to be observed is to protect all of those parts of the ship whose integrity is essential to her fighting power, by armor of the greatest practicable thickness, giving

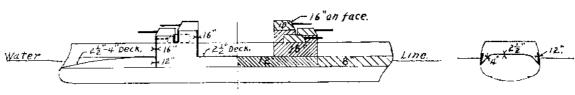


Fig. 8.—Longitudinal Section Showing Disposition of Armor.

Fig. 8a.—Midship Section Showing Relation of Protective Deck to Belt Armor.

THE BATTLESHIP OF THE FUTURE.—II.

all these parts substantially equal protection. The center of the ship constitutes a steel-walled fortress within which are assembled the boilers, engines, magazines, and other vital machinery and stores. In Fig. 8 are shown the midship and longitudinal sections of the ship shown in plan in Fig. 7. It will be seen that the walls of vertical armor constituting this fortress are about 12 inches thick above the water line, and taper to perhaps 9 inches thick at the lower edge, some six

or eight feet below this. Meeting this lower edge is a sloping deck from $2\frac{1}{2}$ inches to 4 inches thick, which becomes horizontal when it has risen to the same vertical height as the top of the armor belt. The end walls of the fortress, which are known as the armored bulkheads, are of about the same thickness as the side walls, but are protected by the armored deck, instead of protecting it. Thus any shot entering this central fortress must first penetrate two thicknesses of steel, one or both of which it must strike obliquely. If the projectile be a shell, the first thickness of armor will explode it, and the second thickness will effectually prevent the pieces from entering any vital spaces. The only projectile which can penetrate will be the comparatively harmless solid shot.

From the armored roof of this fortress rise the barbettes or citadels which form the supports for the gun turrets. The thickness of the armor inclosing these supports, and the ammunition hoists and gun mountings contained in them, will be about 16 inches in the case of the ship we are considering. The armor on the faces of the turrets will be of about the same thickness, while the sides and backs, being in general turned away from the enemy, will be thinner.

The entire water line of the vessel should be protected by armor of sufficient thickness to prevent the entrance of "common shell," a type of projectile carrying a very heavy and destructive bursting charge. This belt will have to be 8 inches thick if it is to oppose 14-inch guns, since common shell will pierce half its caliber of armor. There are a few other parts of the ship which it may be advisable to protect from shell fire, but in general the same principle holds in the case of armor as with guns, namely, that all armor should have the same resistance to penetration, just as all the guns should have the same penetrating power.

Besides the rifled gun, the only practical weapon of offense known to naval warfare is the torpedo. If two fleets of equal cost engage each other, the fleet of smaller and more numerous vessels will have the advantage in torpedo warfare. It will, however, be at a disadvantage with respect to gun power, armor, speed, and coal endurance. Since the vast majority of naval battles are decided by gun fire, the advantage will in general lie with the larger ships, but the possibilities of torpedo warfare will always act to prevent a further increase in the size of ships, if there is any doubt that the increase in size will confer a more than proportionate increase in power and efficiency. It is entirely possible that sufficient improvement may be made in the design and operation of torpedoes to throw a very decided advantage on the side of the smaller and more numerous ships, in which case the tonnages of the present may be adhered to for the future, or even reduced. This is a matter which can only be decided by pushing to the limit the development of torpedoes.

To have such an effect on the size of our future battleships, a torpedo must be designed with an effective range nearly equal to the effective range of the guns carried. It is not sufficient that the torpedo should run merely the distance indicated, but its speed and accuracy must be such that there shall be a reasonable percentage of hits, and its power must be sufficient to inflict a great deal of damage. Mechanically, it is possible to construct a torpedo of sufficient range and power, but the chances of a hit are very slim, unless used against a disabled ship, or a large fleet maneuvering in certain formations. We may construct a torpedo two feet in diameter and twenty feet long to carry 500 pounds of high explosive at a speed of 50 knots or more, and to execute any assigned course over a given area. If the course of a distant hostile fleet could be predicted for say eight or ten minutes ahead, it would be possible to have fifty or one hundred of these terrible engines of destruction continually circling in the waters over which the fleet would pass. Such a development of torpedo warfare would cer-

tainly affect naval tactics, and probably, battleship design.

No protection that we know of at the present time will avail against the torpedo if the size and cost of that weapon be sufficiently increased. To repel the attacks of torpedo boats, a battleship must be armed with a battery of from twelve to twenty guns of small caliber. It is evident

that the effective range of these guns must exceed the effective range of the torpedo, that the caliber of the shell must be sufficient to destroy the torpedo boat before it has launched its bolt, and that the rate of fire must be very high. To obtain the requisite range and stopping power, a 5-inch gun is necessary, and to obtain a sufficient rapidity of fire to make such a defense effective against a simultaneous attack by several boats, the operation of the gun should

be as nearly as possible automatic. Such a gun would require a large supply of ammunition, and powerful ammunition hoists, on account of the rapidity of fire. A battery of such guns would perform many of the functions in battle for which the secondary battery was originally designed, the most important being the attack of unarmored and lightly armored vessels, such as scouts, cruisers, and destroyers.

The speed of battleships will probably be subject to less variation than any other characteristic in the future. The speed of modern types of hulls may be represented very accurately by the formula

$$S = 6.35 \sqrt[3]{H. P. \div D^{\frac{2}{3}}}$$

where S is the speed in knots, H.P. is the horse-power of the engines, and D is the displacement in tons. Designers seem at present to be of the opinion that the best results are obtained in the matter of all-around fighting efficiency by allowing 1 horse-power for each ton of displacement. This gives for various sizes of ships the speeds noted in Table IV.

The speeds may be made somewhat higher than this by increasing the engine power at the expense of armor, guns, economy, and cruising radius. It is not likely that they will exceed the speeds given by more than a few per cent, since these speeds, particularly for the larger ships, are amply sufficient for all strategic purposes. Tactically, additional speed confers no advantage that is not had more cheaply from heavier armor and armament. Of course the faster ship may theoretically choose her position and range, but if she is overmatched in guns and armor at all ranges, her only choice is to run.

We may therefore conclude that the speed of the battleship of the future will be kept down to the neighborhood of 20 knots, unless some radical change is introduced in her propelling machinery which will both lighten it tremendously and add at the same time to its efficiency. As a practical illustration of the cost of speed, let us take the case of one of the above-mentioned vessels, having 20,000 tons displacement, and 19.1 knots speed, and give it a speed of 24 knots. To do this, we must take 2,000 tons from the weight of its armor and armament, giving a reduction of over 40 per cent in its fighting power. In addition, we have increased the cost of maintenance of the vessel by about 25 per cent, and diminished its economical cruising radius in the same proportion. Even if we regard the 25 per cent increase of speed as producing a vessel of 25 per cent greater efficiency for the same fighting power, which is very doubtful, a fleet of such 24-knot ships will have only 60 per cent of the fighting power of a fleet of 19-knot ships costing the same money. While for certain purposes it may be advisable to build a few such ships, they will be by no means the most powerful and effective ships for their cost, and they will be of real value only in exceptional service demanding great speed.

Other things being equal, the further that a ship can travel without replenishing her coal, the more desirable she is. The greatest distance that a ship can travel without replenishing her bunkers is known as the coal endurance, the cruising radius, or the radius of action of the ship. This quantity varies for similar vessels as the cube root of their displacements, and for different types of engines inversely as the coal consumed per horse-power-hour at economical cruising speeds. The radius of action of the battleship of the future therefore depends almost entirely on the type and economy of the motive power.

So far as we know at the present time, there are three types of prime motors available as the propelling engines of warships: namely, the reciprocating steam engine, the steam turbine, and the producer-gas engine. Each one of these types has its own peculiar advantages which fit it for some particular service. The steam turbine has the advantage of freedom from vibration and also of extreme mechanical simplicity. The steam engine gives the best control of the ship when maneuvering, a matter of very great importance in naval warfare. The gas engine is the best of the three from the standpoint of economy of fuel and maintenance. Comparing these motors one with the other we find as follows:

In the case of the steam engine compared with the steam turbine, we find that for equal efficiency at all powers, they are of practically equal weight, since we require three turbines, called the cruising turbine, the backing turbine, and the main turbine, to perform the same service ordinarily obtained from one reciprocating engine. In addition to the matters of mechanical simplicity and freedom from vibration, the turbine is set low in the ship, and so is more easily protected than the steam engine. The steam engine is cheaper in first cost, is more easily repaired when injured in battle, and the ability to maneuver readily conferred by its use is a matter of very great moment in fleet actions. We may therefore conclude that while the steam turbine may be a preferable equipment for highspeed passenger ships and torpedo boats, it does not possess any great advantage over the reciprocating steam engine when installed in a battleship.

Comparing a gas engine using producer gas made from ordinary steam coal, with the steam engine, we will find that the total weight for a given power is practically the same in each case. It is possible to balance the gas engine more perfectly than the steam engine, but it will give more vibration than the steam turbine. By the use of compressed air for starting and reversing, the gas engine becomes as easily controlled as the steam engine. The gas engine will be set lower in the ship than the steam engine, but not so low as the steam turbine. In all other points, the gas engine is far ahead of either of the other types of motors. as will appear from the following considerations:

The efficiency of the gas engine in the matter of fuel consumption is twice as great as that of either of the other motors. This doubles the radius of action without any increase in the size of ship, a matter of great importance. The cost of fuel while the ship is in operation is only half of that for a steam-driven ship, The cost of maintenance also is very much less, since the upkeep of the producers is only a fraction of that of the boilers necessary in a steam-driven ship. The gas engine produces no smoke, which reduces materially the chance of discovery by the enemy, while the clouds of smoke belched from the funnels of a steamdriven vessel make its discovery an easy matter. In time of battle these same clouds of smoke and flame escape through the shot holes in the funnels and entering the gun spaces of the ship make the guns almost untenable, a condition of affairs which would not obtain in the case of a ship driven by gas engines. Should a shell penetrate the boiler room of a steam-driven ship, the damage to life and material would be enormous, and hours or days would be necessary to repair it. Should a shell penetrate the producer room of a gas-powered ship, the damage would be slight, and easily repaired, since the producers would be under suction, not pressure. Lastly, the producer-gas engine offers the combination of an economical motor of reasonable weight using coal as a fuel for low powers; and liquid fuel, which can be stored indefinitely in the double bottom of the ship, can be quickly gasified to greatly augment the power in case of emergency. Take for example a ship of 20,000 tons displacement. Equipped with engines of 30,000 horse-power, and producers of 10,000 horse-power, such a boat would have an economical cruising speed of 15 knots, and a very large radius of action. Should occasion arise, the more expensive liquid fuel would be instantly available to develop the entire 30,000 horse-power, giving her a speed of 22 knots. The whole weight of the apparatus would not exceed that of a 20,000-horse-power steam plant, and the ship would lose none of her effectiveness as a fighting machine.

We may therefore expect that the battleship of the future will be driven by producer-gas engines. The change will be slow to come, on account of the reluctance of both naval officers and naval designers to undertake to install or use anything so novel. In the substitution of any new and untried piece of apparatus for an old and tried one, the tendency is always to minimize its virtues and magnify its faults. Conservatism is practised to a grievous fault in all engineering work, more particularly that of a military or naval character. The gas engine will for this reason be slow in finding its place in the navies of the world, in spite of its many advantages, although its eventual adoption

In determining the displacement necessary to carry a given armament with the best efficiency, we will be guided by the following principles: First, that the total weight of the gun structures, including turret. barbette, loading gear, etc., varies as the square of the caliber when similar guns are in question. Second, that when guns of the same caliber differ in length, the total weight varies as the square root of the length. Although these principles are approximations, they are nevertheless very nearly true. We will, then, have for our displacement the formula

$$D = K N C^2 \sqrt{L},$$

where D is the displacement in tons, N is the number of guns if mounted in separate two-gun turrets, C is the caliber of the guns in inches. L is the length of the guns in calibers, and K is a constant to be determined by reference to existing designs. Taking the case of the "Dreadnought," we have for the value of K very nearly 1.90, which value we will use.

In Table IV. we have the tonnages of vessels carrying from eight to twenty guns of different calibers. The length, breadth, and draft there tabulated are found by multiplying the cube root of the displacement by coefficients found from existing ships. The speed and armor thickness have been taken from Table III. The cruising radius given is for steam power, and is found by the formula

$$R = 220 \sqrt[3]{D}$$

where R is the radius in knots and D is the displacement in tons. For gas-powered ships, the cruising

TABLE IV.

Arr. Number. Caliber Guns, Inches.	Number Guns.	Displacement.	Length.	Breadth.	Draft.	‡ Speed.	\$ Cruising Radius.	Armor Thick- ness, inches.	Cost.	Figuring	Figuring Efficiency.
1 12 †1 14 2 12 4 12 †4 14 6 12 †6 12 †7 8 *7 10 7 12 †7 14	8 8 10 12 12 12 12 12 16 20 20 20	15 500 21,000 19,500 23,400 32,000 21,400 28,000 26,000 13,000 29,000 39,000	425 470 460 485 540 470 516 503 430 50° 525 580	76 84 -82 90 100 85 93 90 70 80 94 104	2616 2814 3014 3014 3114 3114 25 2834 3214 3214 3214 3214 3214 3214 3214	18.5 19.2 19.0 19.4 20.2 19.2 19.8 19.7 23.0 24.0 20.0 20.8	5,500 6,100 6,000 6,300 7,000 6,100 6,70 6,500 5,100 5,800 6,800 7,50	13.5 15.0 16.0 17.7 15.2 17.0 16.4 7.0 9.0 17.1 19.0	\$7.260,000 9.900,000 9.200,000 11.000,000 15.000,000 13,200,000 12,200,000 9,600,000 13,600,000 18,300,000	153 282 181 259 460 266 473 308 76* 182* 422 750	

* These two vessels are armored cruisers, not battleships.
† It will not prove advisable to build these vessels unless their armor shall be able to resist the attacks of the 12-in h gun at the longer ranges. Should the 12-inch gun be able to penetrate their armor, the efficiency given is too high, as is also the fighting power.
‡ For gas-powered ships the speed is three knots m re.
§ For gas-powered ships the cruising radius is doubled.

For gas-powered ships the fighting powerand efficiency are each 25 per cent greater.

radius would be twice the figure given, and the speed would be three knots higher. The cost given is that of the entire ship, armor and armament included, estimated at \$470 per ton.

In the column headed "Fighting Power" will be found a factor representing for each ship the writer's idea of her fighting abilities. This is found by multiplying together the power of the arrangement in gun units, the cube of the gun caliber, the square of the cube root of the armor thickness, the speed, and the sixth root of the cruising radius. It is evident that the relative value of these various elements is very largely a matter of opinion. The writer has not ventured his own opinion in this matter, but has given instead the opinion of the majority of naval designers as expressed in their most successful designs. The fact that designers stop at 25 per cent of the displacement for armor protection, instead of increasing the proportion and so thickening the armor, shows their opinion of the value of a given thickness of armor as compared with any other thickness. The "Fighting Efficiency" given in the next column is the quotient found by dividing the fighting power by the displacement.

While forecasts of the future are always uncertain, and it is impossible to see how changed conditions will affect the design of battleships, it is nevertheless reasonable to assume that the increase in tonnage will go on at about the same rate as it has in days gone by. In general, the tonnage will be the maximum which the development of docks and harbor facilities will permit. These developments go on under the influence of unchanging economic law, and are not affected materially by new discoveries and inventions, unless indeed these discoveries and inventions are of such vital and far-reaching importance as to affect in unforeseeable ways all marine design, that of battleships included. We are therefore reasonably safe in predicting the size of future battleships for given epochs by the law of increase in past years. In 1875 the average tonnage of first-class battleships laid down by Great Britain was 9,500. In 1885 it was 11,000. In 1895 it was 14,500. In 1905 it was 18,000. The law of increase is roughly 25 per cent per decade. Assuming that the same rate of increase is to hold for the next thirty years, we will have in 1915 ships of 22,500 tons, in 1925 ships of 28,000 tons, and in 1935 ships of 35,000

The Death of Prof. Mendeleef.

Prof. Dimitri Ivanovitch Mendeleef, one of the greatest chemists in the world, died recently in St. Petersburg. He was born in Siberia in 1834, and when a young man went to St. Petersburg, where he received his education. In 1861 he became professor of chemistry in the Technological Institute in St. Petersburg and became famous, not only as a chemist and a teacher, but also as a geologist and philosopher. In a few years he succeeded to the chair of chemistry in the St. Petersburg University. His field of original research was wide, and in 1871 he foretold the existence and general properties of three new chemical elements now tabulated under the names of gallium, scandium, and germanium. He wrote many papers on chemical topics, and his book, "Principles of Chemistry," was reprinted in many languages. He received the Cowley gold medal at a meeting of the Royal Society in London last year.

Formaldehyde Useless as a Preventive of Frilling.

Photography states that the practice of adding a little solution of formaldehyde to a developer to prevent frilling is entirely without effect owing to the decomposition of the formaldehyde by the sodium sulphite which is a component part of practically all developers. This results in the liberation of sodium hydroxide and may cause fogging owing to an excess

TOBACCO RAISING IN THE PHILIPPINES.

BY HAMILTON WRIGHT, SPECIAL COMMISSIONER IN THE ORIENT OF THE PACIFIC COMMERCIAL MUSEUM (WITH PHOTOGRAPHS BY THE AUTHOR).

Save for some little statistical information regarding the tobacco manufactories of Manila, less is known in America of Philippine tobacco than is known of it either in Europe or Asia. Nine-tenths of all the tobacco raised in the islands, and practically all that is used commercially, is produced in the vast Cagayan valley of central and northern Luzon, a region of which even many Americans in the islands have little

first-hand knowledge. The valley is out of the general line of travel, and attention was not directed to it during the insurrection; its people were "pacificos."

Yet here is one of the most fertile valleys in the Philippines. Perhaps it is among the richest in the world. For a period of more than one hundred and forty years tobacco has been raised on the overflowed lands of the valley without artificial fertilization. It is the custom of the Cagayanes to raise one crop of tobacco and one crop of corn on the same land in one year. In two succeeding years two crops of tobacco and three crops of corn have been produced from the same soil. The Rio Grande de Cagayan, from which the valley takes its name, is the largest river in the Philippines. It is at once the Nile and the Mississippi of the archipelago. Rising in the Cordillera mountain range of central Luzon, the backbone, as it were, of the great island, the Cagavan flows north for a distance of 225 miles as the crow files, until reinforced by many large tributaries, it at last empties into the China Sea at Aparri, the northernmost port of Luzon.

The purple-peaked Cordilleras gradually widen to make way for the huge river, forming the east and west boundaries of a vast grassy plain almost two hundred miles long and with an average width of between thirty and forty miles.

The bulk of the tobacco in the Cagayan is raised like so much hav. Little attention is given to the details of curing and harvesting, which in the case of so intricate a crop demand both scientific and experienced treatment. Most of the good tobacco land is the overflowed land, which consists mainly of small pockets, belts, and patches, with occasionally greater areas of level land lying along the bed of the Cagayan River and its tributaries, and which doubtless formed the bed of the river at an early period. At the end of the rainy season during the latter part of December the northeast monsoon blows up the river from the China Sea, causing the water to rise, when a freshet occurs, as much as twenty feet in as many hours. It overflows the ground to a depth of two or three feet. With the lull of the wind in a few days this back-water recedes, and a heavy deposit of silt is left on the land.

a carabao plow. The carabao covers but one-fifth of an acre a day. It usually takes three or four plowings to get the ground into condition for planting. The plow itself is a primitive affair made from the crotch of a tree. It goes but four inches deep, and moves so slowly that it does not "turn" a furrow. Such a thing as seed selection is unknown to the majority of natives. "Topping the plants," or nipping off the higher stems to force vigor into the leaves, is usually disregarded. Cutting off the "suckers" is seldom practised. After the tobacco is dried it is often strung under the dwell-



Loading Baled Tobacco on a Scow.



Philippine Precocity in the Use of the Tabaco Grande.

ing among the pigs, chickens, and carabao. When the leaves are picked they are cured in the sun, but frequently are allowed to mold and mildew afterward, thus bringing them down to the fourth or fifth grade. It is the curing which largely determines the grade, and consequently, the price of the tobacco. Only the large plantations have curing sheds.

Despite the many drawbacks in cultivation and curing, a very fine grade of tobacco is produced in the Philippines. At the Hacienda San Luis of the Tabacalera Company some wrapper leaf is being raised under shade. Señor Orres, manager c' the plantation, claims that it is not surpassed by any leaf tobacco in the world. Prof. Lyon, of the Insular Bureau of Agriculture, believes the Cagayan valley equal to the famous Vuelta Abajo district of Cuba. But most of the tobacco is of inferior grade. It is spoiled in the curing. Even with free trade with the United States it is doubtful if tobacco of fine grade will be raised in sufficient quantities to make it a formidable competitor in American markets. It will take years to educate the people to raise and cure it properly. One-fourth the

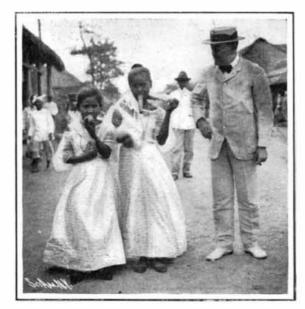
best tobacco land is a small fortune to the natives. The average family lives by less than a hectare (2.47 acres) of land. The whole family helps in the work. Almost all of the working population of the valley is connected with the industry in some way or other. Though most of those engaged in tobacco production are small owners, there are half a dozen large firms operating in the Cagayan valley, the Spanish and German firms predominating. The largest corporation is the General Tobacco Company (Compañía General de Tabacos de Filipinos) which was established in 1882.

Little actual capital, it is said, was invested in the undertaking, but to-day this company is without question the most powerful corporation operating in the islands, whose revenues are derived there. It is capitalized for \$17,000,000 (gold) on which it pays generous dividends.

There is but one American company. the Philippine Plantation Company, in the valley. This company is deserving of notice here as the largest, and practically the first American agricultural corporation of any size that has actually cultivated the ground on an extended scale since the American occupation. The company purchased the old Maguidad estate of 44,000 acres, near Tuguegarao. It has erected modern buildings on the plantation, which is provided with the equipment of an up-to-date tobacco estate. Lieut. Schermerhorn. the manager, had a considerable area in tobacco this year, which was his first season. Next spring it is hoped to have a 5,000-acre crop, which will be the largest single planting in the valley. The future of this plantation will be watched with interest by the government experts

and others who are anxious for the success of modern methods of agriculture.

Philippine tobacco is sold in thirty-five different countries. From Canton to Peking the most expensive and also most generally sold cigarette comes in a package of Manila tobacco put up in Austria. Manila cigars are the most popular in Japan and sell at 30 sen (15 cents American money) though the Japanese government itself maintains a tobacco monopoly. But the value of the Philippine tobacco crop sinks into insignificance when compared with the world's increasing supply and demand.* The value of the tobacco manufactured in the Philippines in 1905 is estimated at \$5,494,627.† \$892,561 worth of cigars and \$14,250 of cigarettes, or a total of (manufactured tobacco) \$906,811, and \$1,374,892 of leaf tobacco (manufactured) was exported. \$3,212,924 worth of manufactured tobacco therefore remained in the islands. Besides this a presumably enormous quantity of leaf of an inferior grade was sold or traded to natives of the Philippines, who often roll their own cigars before smoking. When manufactured in other countries the unmanufactured



Judge McCabe of Tuguegaro and Two Young Ladies Whom He Met in the Market Place One Sunday Merning as They Were Returning from Mass.

On the overflowed land tobacco is planted during the latter part of January or early in February, while on the high land it is planted several weeks earlier. In three months the plant has reached a height of from four to six feet. The leaves begin to get yellow in spots and curl back. It is ripe.

It is interesting to note how the native raises tobacco. Before transplanting to the high or the overflowed land, young tobacco plants have been grown thickly in a seed bed. When they are six or eight weeks old they are transplanted to soil which has been crudely scratched during the time of their growth by



Hauling by Carabao (Water Buffalo), the Most Common Method of Transportation in the Philippines.

TOBACCO*RAISING IN THE PHILIPPINES.

present area in tobacco with greater attention would yield better returns than the present careless cultivation

In contrast to the former government monopoly, today in the Cagayan the people own and control their own farms. In the province of Cagayan there is a population of 142,000, with 23,000 land owners. With five to a family, and excluding middlemen, it seems fair to assume that almost every farmer owns his own land. A similar condition holds good in the province of Isabella, south of Cagayan province, which includes the rest of the tobacco land. A very small plot of the



Loading Tobacco in a Banquelia for Shipment Down the River.

tobacco brings from thirty to fifty times its selling price.

The greatest consumers of Philippine tobacco are the Filipinos themselves. With a population of

^{*}In the United States alone 440.000,000 pounds of tobacco are consumed annually. Germanyranks next with a consumption of 201,783,000, Russia 150,244,000, France 84,393,000, United Kingdom 83.378,000.

[†] This estimate is, presumably, much lower than the actual amount of tobacco manufactured. When, for mstance, for purposes of revenue the value of tobacco manufactured is classified at less than \$25 and more than \$10 per thousand cigars, for the purposes of this article the value has been taken at but \$10 per thousand cigars.

over eight millions, practically all of whom, even the non-Christian tribes, are incessant smokers, usually including women and children as well as men, and with many districts where tobacco is not raised for family consumption, the consumption of tobacco must be many times the value of the export. In the Cagayan a most unique custom prevails among the women, who smoke a huge cigar, the *tabaco grande*, which reaches a length of from thirty inches to three feet and is several inches in diameter. These huge cigars are smoked off and on for a day and a half or two

days. Sometimes a tabaco grande is suspended in the middle from a rafter in the dwelling, and all the women folk of the family puff in turn. The men smoke the cigarettes or the ordinary-sized cigar.

February 16, 1907.

When the railroad projected through the heart of Luzon to connect Manila and Aparri is constructed, the tobacco industry will be immensely stimulated by the attention directed to the Cagayan. In the event of free trade the industry will profit not so much through enlarged markets in the United States (for there is always a demand for all good-class Philippine tobacco) as through the

stimulus given to the importation of modern machinery and the feeling of encouragement given the islands generally.

A Rubberless Pneumatic Tire.

Experiments are being carried out in London upon a 15-horse-power automobile and a few heavy mechanically propelled vehicles with a new material that has been evolved as a substitute for pneumatic tires. As is well known, although the latter type of tires possesses great resiliency, conducing to complete comfort in riding, its liability to puncture is a decided disadvantage. In this new tire the resiliency of the pneumatic tire is retained as much as possible, while puncturing is completely obviated. "Elastes," as this new material is called, comprises a mixture (in predetermined quantities which vary according to the type of vehicle to be fitted, the nature of its traffic, and the roads upon which it is designed to ply) of three substances---glue, glycerine, and chromic salts. These are dissolved and mixed at a high temperature and while in the liquid condition are injected into the inner tube of the tire. The compression of the material and consequently its density also fluctuates according to the foregoing conditions.

For filling, the inner tube is mounted in situ upon an ordinary tire rim with the outer cover in position. The inner tube is provided with two valves—one through which the "elastes" is injected, and the other for the escape of the dis-

placed air. When filled the tire, intact, upon the temporary rim and with the outer cover in position, is set aside for several days to set. It can then be mounted upon the wheel in the usual way. The inner tube is set in position in the rim with a protecting cover of canvas glued on the tread. The outer cover is stretched and secured in the rim as usual. It is claimed that "elastes" will retain its consistency under all variations of load and temperature and is not deteriorated by wear. It has no tendency to harden or disintegrate, and in fact so long as it is not ex-



Stevedores Posing for Their Pictures and Incidentally Getting a Breathing Spell.

posed to actual friction can be used over and over again. The one disadvantage that it possesses is that the weight of the car is increased from 20 to 40 pounds per wheel; against this, however, must be set the weight of spare tires which have to be carried under ordinary circumstances. Those who have submitted their cars, with wheels shod in this manner, to practical tests state that the tires thus filled are in every way as comfortable and resilient as the ordinary pneumatic tires.

Prof. A. Agassiz's Scientific Cruise.

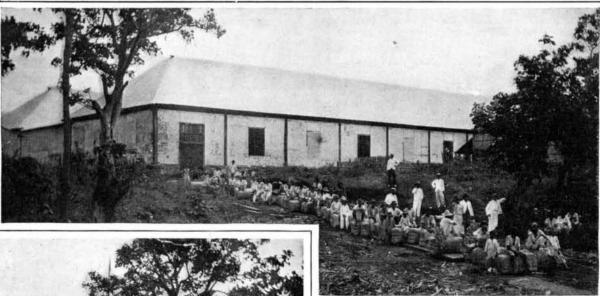
The steam yacht "Virginia," chartered by Prof. Agassiz for a scientific cruise to the Windward and Leeward Islands, started on its journey on February 5. To sound and dredge the depths of the sea, to study ocean temperatures the superficial and submarine currents, are the objects of the voyage. The subject of seismic disturbances, especially in the neighborhood of Jamaica, and of the known seismic area of the recent earthquakes, both on land and seaward, will be carefully investigated. A great change is expected to be found in the soundings about the island of Jamaica. The violent disturbances of the earthquake have caused islands to appear in the Pacific,

which later sank thousands of fathoms, with a subsequent settling of the ocean bed. Waterspouts, too, will receive the attention of Prof. Agassiz and his staff. These spouts, Capt. Howland Patterson states, have been known to pursue a straight path for several minutes, then to curve suddenly, and again to rush off at a right angle to their former course. Such waterspouts have foundered good-sized vessels.

Prof. Agassiz commenced scientific investigations in 1859. In that year he went to Acapulco to collect specimens for the Museum of Comparative Zoology

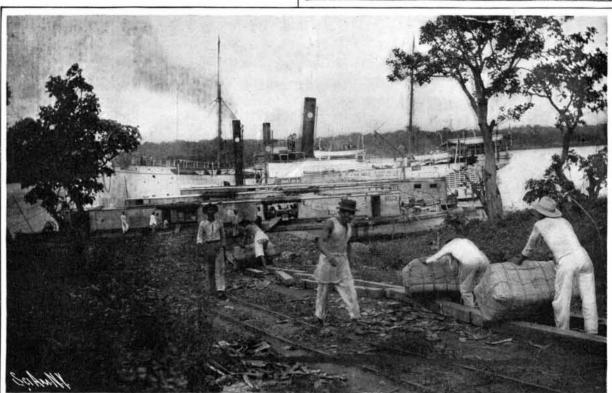
at Harvard. He then took up coast survey work in California, where he became a mining expert. He explored the west coast of South America in the early seventies, and sent tons of specimens to the Peabody Museum. He spent five years in deep-sea dredging on board the steamer "Blake," a vessel which the United States Coast and Geodetic Survey placed at his disposal. On his return from his cruise on the "Virginia," Prof. Agassiz expects to be able to add much valuable information to that already possessed by sci-

Dr. F. V. Darbishire, of Manchester, and Dr. E. J. Russell, of Wye, Kent, dealt with the "Oxidation in



Loading Baled Tobacco from the Giant Warehouses at Lalloc in Waiting Steamers on the Cagayan River. Machinery Will be Used Some Day.

Soils in its Relation to Productiveness," before the British Association for the Advancement of Science. All soils, they pointed out, possess the power of absorbing oxygen. They constructed an apparatus to measure the rate of this absorption. The power is mainly due to micro-organisms, but as it continues to about one-fifth of its original intensity in soil sterilized at 120 deg. C. or with mercuric chloride, it cannot be ascribed entirely to micro-organisms. Moisture is essential to oxidation; water-logging stops it; sugar and carbonate of calcium increase the oxidation rate; certain poisons, even mercuric chloride and copper sulphate, increase it likewise, if not present to more than 0.01 per cent. Soils partly sterilized by volatile antiseptics, like chloroform and carbon bisulphide, or by heating up to 95 deg. C., show an improved rate of oxidation, to which greater productiveness corresponds. These results hardly appear consistent, but microbes bear a good deal, and may bear more still when living in the soil.



Loading Steamers with Baled Tobacco at Lalloc on the Cagayan River Fifteen Miles from Its Mouth.

TOBACCO RAISING IN THE PHILIPPINES.

THE SUBSIDENCE OF A CONCRETE BUILDING.

Since the establishment of the French protectorate over the Beytik of Tunis, its capital, of the same name, has never ceased to grow in extent, population, and wealth. While the Arab city occupied and still occupies the higher and firmer ground, the new French extension spreads from this in the direction of the Bahira or Lake of Tunis to the modern port, which by means of a canal, built at a cost of many millions of French money, traverses the shallow and silting lake, and discharges into the sea at Halg-el-Oued (La Gou-

lette), the former port.

The flat stretch of land, some miles broad, on which the French town is built, is extremely marshy and unstable, a terror to architects and builders. Wonderful are the deviations from the perpendicular and the horizontal which many of the constructions, for the most part temporary, exhibit, collapsing into the shape of the letter X or bulging in-

A recent example, however, far exceeding

to O-like forms.

in magnitude and importance any of the numerous previous instances on the above-described marshy ground, and which presented a modern pendant to the well-known leaning tower of Pisa or that of Saragossa, deserves record.

The Société des Minoteries Tunisiennes has had under construction for many months past three large concrete buildings for the storage of wheat and flour, which Tunis now, as did Carthage of old, ships in abundance to Europe. The buildings include a central and two lateral structures which are somewhat separated from the central one. One of the latter was observed to be gradually deviating from the perpendicular, leaning toward the central block, without, however, losing its rigidity, and this movement of the whole structure continued for several hours until an angle of apparently about 25 degrees was attained. The mass gradually displaced itself as a whole, monolithically, as it were, but the collapse of the building was pronounced imminent by all hands. The engineer and contractor, however, took heart, and confident in the cohesion of concrete, set about restoring the immense mass to the vertical.

This was duly effected in less than a fortnight. The

floors on the elevated side of the building were weighted; this counterpoise consisted of some 4,000 tons of sand in bags on each of the ground or underground floors and 2,000 tons on the upper stories. Excavations were also made alongside the foundations on the same side in order to allow the soil to give way more easily.

The result was all that could be desired under the circumstances. The edifice returned to the vertical in a few days, and was then complete. The construction work proceeded during the summer as if nothing had happened until the 28th of August, which brought another disagreeable surprise to

those interested in this important enterprise. The first building had started from the perpendicular in April; the other lateral structure, August 28. The central one remained steady, it may well be, owing to the compression of the ground beneath and around it by the weight of the two side buildings. A few days previous to the latter date, the building had been finished and the engineer decided to load it with 3,000 tons of ballast, for the purpose of testing its stability, and, particularly, of letting it settle definitively. The first and ground floors had been loaded to the extent

of about 15,000 tons, and this operation was still going on when the theodolite indicated a slight movement on the side farthest from the central structure. The indicated movements were: 7 A. M., 0.79 inch; 2 P. M., 3 inches; 6 P. M., 9.5 feet; 7 P. M., 11.8 feet; 9 P. M., 13.1 feet; midnight, 16 feet.

It appears that the center of gravity, around which as a pivot the building turned, was on a line passing through the center of the block. The efforts of the engineer were accordingly directed toward maintaining this center of movement stationary, and the floor of



The Structure After Being Raised to Its Normal Position.

THE SUBSIDENCE OF A CONCRETE BUILDING.

the building on the upheaved side was elevated about three yards above its normal height. The method adopted in April was again employed in August, and with equal success. The material already in the building was transferred to the elevated side. In the case of both buildings the subsidence has been considerable, for both now stand five to six yards below their intended level. The site is responsible for these accidents, which have been a source of no little expense, delay, and vexation. The ground was, however, declared solid enough by an Italian engineer, whose plans were followed. The displaced and replaced buildings remained uninjured and their parts were undisturbed, a wonderful testimony to the cohesion and tenacity of these concrete structures. The armored concrete construction is now, in consequence, lauded to the skies. There are those however who maintain that in such situations, the better course regardless of expense, would be to adopt the Dutch system of building upon a foundation of piles.

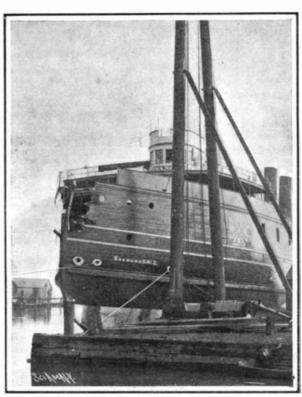
A REMARKABLE ACCIDENT.

The accompanying illustrations are from photo-



Extreme Displacement from the Vertical.

The Grain Elevator After the Impact.



The Transfer Steamer Which Ran Into the Elevator.

A REMARKABLE ACCIDENT.

graphs of a strange accident which recently took place at Milwaukee, Wis. One of the elevators of the American Malting Company is located on the bank of the Milwaukee River, upon which considerable heavy traffic is constantly being carried on. A large railroad transfer vessel used for moving loaded railroad cars ran into the bank, owing to a misunderstanding of signals by the engineer. Through this misunderstanding the boat was sent ahead at full speed instead of backing, with the result that 1t plowed through six or eight feet of piling and con

crete and thrust the elevator from its foundations, which extended about four feet above the ground. The force of the impact was such that the elevator was shoved into an adjoining brick malt house, and forced about ten feet into the latter building. The tremendous energy with which the vessel crashed into the elevator is clearly to be seen from the condition of the latter as well as that of the malt house. Incredible as it may seem, the transfer vessel was damaged to a slight extent only, the woodwork of the upper part of the bow being shattered for a few feet. while the

lower part of the stem was not even dented. This remarkable fact is surely a strong recommendation for the solid construction of the boat, which was probably intended for heavy work in broken ice.

New Railway Signal Devices.

In discussing the recent block signal systems for electric railways, Engineering News states that the North Shore Railway, Sausalito, Cal., is equipped with alternating-current sig-

nals. Semaphores are operated by small storage batteries contained in the pedestals. These are charged through high resistances by current from the third rail. Thus power is available when the electric service is shut down for part of the night. Two wires carry alternating current at 2,300 volts for the track circuits and for lighting the signal lamps at night. Upon one of the line-wire poles at the advance end of each block section is a transformer, the primaries of which are connected across the wires above mentioned, while the secondaries are connected with the ends of the track current. Across the rails at the other ends of the track circuit is connected the track relay which operates inductively to close the local circuit controlling the signal. When a car or train enters the block section, this relay is shunted, opening the signal circuit and causing the signal to go to the "stop" position. The Boston and Worcester Railway, operated by trolley, and running through hilly country, has adopted, to avoid rear collisions (the track is double) electricallyworked semaphore arms with illuminated spectacles. The signal works positively at any speed of the cars without throwing the trolley off the wire. The United States Electric Signal Company use lamp sig-

> with which there may be inclosed disks. Each disk revolves on a horizontal transverse axis passing through its center, for signaling purposes. These, as well as the lamps, are worked by automatic trolley switches and relays. Where cars pass the turnouts at speeds of over 15 m. p. h., a special form of switch, subject to the upward pressure of the wheel, is used, and avoids displacement. of the latter. For single tracks this company employs a box at each end of the block section having a large lens with a red disk revolving behind it, the disk having a red bull's eye in the center. In the upper part of the box

nals, in combination

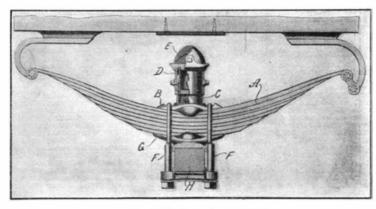
a green light appears when the "stop" signal is displayed at the opposite end of the block. A car entering a block causes the red target to show at the far end of the section and sets green light at the box just passed. White lights show that the section is clear, and appear automatically when the last car passes out.

The deposits of both lead and zinc ore, whether in association or alone, form most readily in connection with a dolomite or limestone country rock.



VEHICLE SPRING BUFFER,

With a view to relieving the springs of a vehicle from sudden jars under heavy loads, and thus preventing them from breaking, Mr. Peter McKay, of Day Dawn, Murchison, Western Australia, has invented the buffer which we illustrate in the accompanying engraving. The buffer, which is of simple design, may be readily clamped to any vehicle spring. Our engraving

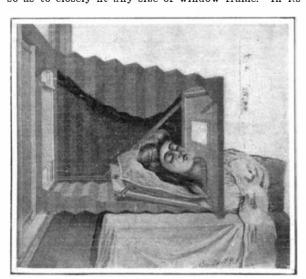


VEHICLE SPRING BUFFER.

shows at A a vehicle spring of common type. Mounted on this spring is a plate B, which is formed with an annular channel, and in this channel a tubular member C is seated and secured. The member C telescopes with an upper member D formed of two tubes, one within the other, and spaced apart to form an annular recess which the member C is adapted to enter. To limit the relative motion of members C and D, studs are threaded through the outer tube D, and project into slots formed in the tube C. The inner tube D carries a plunger head, which is adapted to engage a block of rubber, secured to the plate B within the tube C. Mounted on the upper end of tube D is a cap plate, which carries a hemispherical block of rubber, over which a cap E of softer rubber is secured. The buffer is held in place on the spring A by means of yoke pieces F, which engage the plate B and a plate G, fitted against the under side of the spring. These yoke pieces are formed with extensions, which are bolted to a plate that passes under the axle H. In operation, when the spring A is forced down excessively, a wear plate on the vehicle will engage the cap E of the buffer, forcing the plunger head carried by member D into engagement with the rubber block on the plate B, thus relieving the spring from undue pressure.

FRESH-AIR CABINET.

In the treatment of tuberculosis fresh air is most essential, and in order to obtain plenty of fresh air at night it is customary in many sanatoriums to have the patient sleep with his head within a cabinet which communicates with an open window. A cabinet of this general class, but possessing many valuable improvements, is illustrated in the accompanying engraving. Primarily, the cabinet is collapsible and when not in use may be folded into a small compass. In addition te this the invention provides a curtain at the outer or window end of the cabinet which may be raised or lowered to regulate the amount of air admitted, while the opposite end of the cabinet is equipped with a curtain arranged to fit snugly around the throat of the patient so as to protect the body from drafts and exposure. Our engraving shows the cabinet with one side removed so as to reveal the interior details. The main frame of the cabinet is extensible laterally, so as to closely fit any size of window frame. In its



A FRESH-AIR CABINET.

extended position it is secured by means of thumb screws. The bottom of the frame which rests on the window ledge, and the top of the frame on to which the window sash is lowered, are provided with weather strips of flexible material. The frame at the opposite end of the cabinet is adapted to rest on the couch or bed, and is connected with the main frame by means of brace rods which are slidable upon each other and adapted to be held in extended position by means of thumb nuts. The front and rear frames are also connected by means of a hood in the shape of a camera bellows. The curtain at the front end of the cabinet is mounted on a spring roller which is spaced a short distance from the upper end of the frame to provide an air passage. The curtain may be lowered to any degree desired and is held in place by means of spring-

> pressed rods bearing against the side of the frame. A similar curtain is mounted at the inner end of the cabinet on a roller which is placed at the top of the frame. The lower portion of this curtain is provided with an arched opening braced by a wire rod and provided with a flexible flap which rests against the throat of the patient. In this curtain there is a small window covered with transparent celluloid. Within the cabinet is a pillow rest which consists of a board hinged at one end to the rear frame, and suspended at its outer end by means of hangers from the upper end of this frame. The hangers are slotted to receive threaded studs projecting from the pillow rests and, by means of thumb nuts on these studs, the

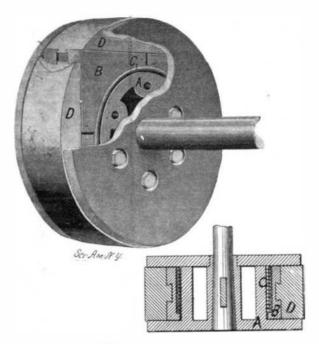
rest may be secured at any desired position. Our engraving shows the cabinet in use and the course of the air through it is indicated by means of arrows. The inventor of this improved cabinet is Mr. J. H. Williams, of Columbia, S. C.

The Current Supplement.

The current Supplement, No. 1624, opens with an article on "The Passing of American Square-Rigged Vessels," by James G. McCurdy. Mr. F. C. Fish thoroughly discusses the ethics of trade secrets, and likewise presents much legal information that must be of interest to inventors. Mr. A. Frederick Collins writes on the making and use of a wireless telegraph tuning device. This article is naturally to be read in connection with the previous articles by Mr. Collins on "The Design and Construction of a 100-Mile Wireless Telegraph Set" (published in Scientific American Sup-PLEMENT 1605); "The Location and Erection of a 100-Mile Wireless Telegraph Set" (published in Scientific AMERICAN SUPPLEMENT 1622); and "The Installation and Adjustment of a 100-Mile Wireless Telegraph Set" (published in Scientific American Supplement 1623). One of the difficulties which every wireless telegrapher experiences is that of bringing the receiving circuits of the receptor into sharp resonance with the oscillation circuits of the transmitter. How this is accomplished Mr. Collins explains by the help of diagrams in the present article. Mr. Elihu Thomson writes authoritatively on alcohol engines as a future power. The Hon. Sir Lewis Michel, well known as one of the late Cecil Rhodes's associates in South Africa, contributes an excellent article on the Cape to Cairo Railway. Dr. H. W. Wiley, who is responsible for the pure food law, states how the whiskies of Great B'ritain and Ireland are made. Among the minor articles of interest may be mentioned those on "Varnish," "The Valuation of Bread," "Treatment of Concrete Surfaces," "Selecting the Proportions for Concrete," "Vibrations of Passenger Cars," "Development of the Frame of Freight Locomotives," "Some Requirements of Carbureter Design."

METALLIC PISTON PACKING.

The accompanying engraving illustrates an improved metallic piston packing composed of comparatively few parts, and arranged to prevent leakage of steam in the cylinder from one side of the piston to the other. In addition to this, the device is so designed as to compensate for all wear of the interior contacting surfaces of the engine cylinder and the packing, thus requiring no reboring of the cylinder. As pictured in the engraving, the improved packing is arranged between two heads keyed to the piston rod. The head A is formed with a spider, which serves to space the heads apart and provide an outer annular recess between them. In this recess the blocks B are fitted, and between them and the spider are a series of springs C. There are four of these blocks B, and their inner edges are curved to fit against the springs. The outer edges of the blocks are angular, and are formed with dovetailed grooves adapted to receive dovetailed tongues on the segments D. It will be observed that the aligned edges of two adjacent angular blocks are engaged by one segment D, and in order to insure a complete fitting of the segments on the blocks, two opposite segments are formed, with longer dovetailed tongues than the intermediate segments. The segments D, it may be observed, are formed with curved outer faces adapted to engage the inner surface of the cylinder. In practice the springs C, pressing against the blocks B, hold the segments D in firm contact with the cylinder, and consequently all wear between the contacting surfaces

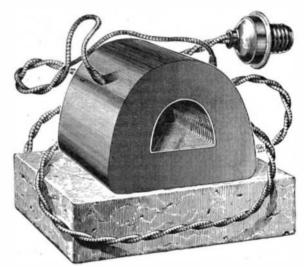


METALLIC PISTON PACKING.

is compensated for, and leakage of steam from one side of the piston to the other is completely prevented. It will be seen that by providing dovetailed connection between the blocks and the segments, they are held together, but allow sliding movement of the segments on the blocks without danger of their becoming disconnected. While this packing is applicable on any engine it has been designed particularly for use on locomotives. The inventor of this improved piston packing is Mr. N. Pflaum, 77 Schmidt Building, Pittsburg, Pa.

A NEW ELECTRIC FURNACE.

At the recent meeting of the American Association for the Advancement of Science, an electric furnace of novel type was exhibited by Prof. William H. Bristol, of Stevens Institute of Technology. This furnace is of the form used by dentists and in laboratories to heat small articles, pieces of metal and the like, to a high degree of temperature. As ordinarily constructed, furnaces of this character consist of a receptacle formed of clay in which a coil of fine wire is embedded. As this wire is heated it expands more rapidly than the clay, and tends to crack the receptacle, unless the heat is applied very slowly. Ordinarily, it requires from ten to fifteen minutes to bring the furnace safely to maximum heat. Prof. Bristol's furnace consists of a receptacle of fused quartz wound with the wire of the heating coil, each turn being insulated from the adjacent one by a cord or thread of asbestos. The heating chamber thus formed is then incased in a refractery non-conducting material, such as asbestos. The coefficient of expansion of quartz is extremely low, and as a consequence, it may be suddenly heated or cooled over extreme ranges without cracking. Hence, the full current may be applied at once to the quartz-lined furnace, and the maximum heat will be attained within less than a minute. The heating coil is made cf platinum or platinum alloy wire when temperatures as high as 2,300 deg. F. are desired for hardening highspeed steel. For the treatment of carbon steel, at temperatures up to 1,600 deg. F. it is expected that nickel wire may be used for the heating coil. A number of these furnaces are now being employed in a manufacturing plant for hardening small, round pieces of carbon steel.



A NEW ELECTRIC FURNACE.

RECENTLY PATENTED INVENTIONS. Pertaining to Apparel.

ARM-SCYE BUST-FORM.—C. H. SCOTT, New York, N. Y. The principal objects of the invention are to overcome various objections by providing a form light and comfortable and produce an attractive and symmetrical figure besides providing for the better metrical figure besides providing for the better fitting of outer garments; also, to provide for the escape of heat or air confined between the pad and the body. The scye is so constructed as to full in the deficiency of an undeveloped bust from the shoulder downward in front to the part of the scye underneath the arm.

LADY'S COMB.—W. J. WATSON, Shawnee,

LADY'S COMB.—W. J. WATSON, Shawnee, Oklahoma Ter. The invention refers to ladies' combs, and particularly to the side combs and back combs which are worn in the hair. It is also applicable to hair-pins. The object of the invention is to produce a comb of this class which is simple in construction and provided with means for preventing its becoming accidentally displaced.

though we endeavor to reply to all either by the sure. Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying rather than general interest cannot be expected without remuneration. Scientific American Supplements referred to may be had at the office. Price 10 cents each. becoming accidentally displaced.

Electrical Devices.

ELECTRICAL APPARATUS FOR SETTING WAYS.—L. KOTTMAIR and R. ZWACK, 86 Lilienstrasse, Munich, Germany. This improvement relates to an apparatus for setting the points and signals on railways by means of electric actuating devices in such a manner that these actuating devices act upon the sepwhen an electric switch belonging to a line is wood, such as is used in making draughts closed each actuating device after being properly set closes the circuit of the next. The belonging to the track are thus automatically gradually wood ashes until the consistency is

Of Interest to Farmers.

the body of the vehicle may be maintained in a level position, irrespective of the inclination on a hill upon which the harvester may be

Of General Interest.

FILTER.-E. BURT, El Oro, Estado de Mexico, Mexico. In this patent the invention relates to high-pressure filters for precious-metalore slimes, as gold, silver, etc., having among other objects the production of an apparatus of this character of large capacity capable of filtering the slimes expeditiously and at a comparatively low cost.

GUN CLEANER .- C. T. FORBES, Fresno,



HINTS TO CORRESPONDENTS.

price. erals sent for examination should be distinctly marked or labeled.

(10380) P. M. C. says: We desire some THE POINTS AND SIGNALS ON RAIL-cheap adhesive substance that can be used in manufacture of briquettes to contain charcoal and sawdust. A. Coal tar and molasses are the substances used for briquetting, and are both quite cheap.

(10381) B. D. wishes a receipt for a arate points and signals in succession, so that glue that will satisfactorily glue celluloid to closed each actuating device after being properly set closes the circuit of the next. The whole or a portion of the actuating devices belonging to the actuating devices belonging to the treely set. similar to a thick varnish. Use hot.

(10382) C. C. A. says: I have a gas engine cylinder that leaks water through fine PLATFORM LEVELING DEVICE FOR holes in the cylinder wall near a boss, the holes HARVESTERS.—E. R. GORDON and D. R. evidently being caused by the "draw" of the Throop, Harrington, Wash. In this instance iron in cooling. Can you suggest any method the invention pertains to a new means for of dosing these pores solidly enough to stand simultaneously raising and lowering the main the heat and pressure of explosion? A. The wheels on the opposite side of a harvester, application of a saturated solution of sal amreaper, or other similar vehicle in order that moniac in water to the spongy surface will soon rust up the leaky places.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending February 5, 1907,

AND EACH BEARING THAT DATE

GIN CLEANER.—C. T. FORBES, Frency
GIN CLEANER.—C. T. FORBES, Frency
Cal. The invention has to do more particularly with a form of handle for attachment to
the outer or rear end of the cleaner-rod, and
the object is to provide a handle adapted to
permit free turning or rotation of the rod and
the fixedly-attached swab at its inner end with
the handle held against turning action.

SCRAPER AND REGULATOR.—J. H.
YOUNG and G. B. YOUNG, El Paso, Texas. The
firvention is an improvement for use in making
at its edges a projecting rectangular tongue
at the edges a (See note at end of list about copies of these patents.)

_		1. EBROARY 10, 1907.
7	Brush or mop holder, E. E. Masters 842,965	Electrical synchronism, E. F. Northrup 843,415
1	Brushes, making, J. Aorrison	Electrical synchronism, E. F. Northrup 843,415 Electrode for therapeutic use, etc., E. T. Nealey 843,354 Electroplating apparatus, H. R. Boissier 843,321
1	Bulleting block melaning machine, is. 11.	Elevator, H. C. Sagenerii 845,501, 843,302
1	Building blocks, P. Olsen	Electroplating apparatus, H. R. Boissier
	Butten, detachable, Z. M. Leger	Embreidering machine, A. Burgess, et al. 842,854 Engine, A. S. Barnes 843,384
	Hickard S45,170 Building blocks, P. Olsen S43,417 Burial casket, drop frent, W. H. Lawsen. 843,157 Butten, detachable, Z. M. Leger. 843,158 Cable, aerial, G. Strambini 843,116 Cable cutting device, C. Petrie 843,359 Calculating machines, adjusting lever arrangement for, F. Trinks 843,566	Embroidering machine, A. Burgess, et al. 842,854 Engine, A. S. Barnes 843,884 Engine cylinder, jacketed, F. W. Brady. 843,068 Engine step mechanism, steam, Fuller &
or or	Calendar rollers for producing embessed of	. Evener, horse, C. Wendiand
ve	raised patterns, J. Kleinewefers 842,894 Camera, W. F. Folmer	Exerciser, physical, G. Muller
n. oe at	Can closure, A. L. Caprini	Eyeglasses, J. C. Moore
d,	Cane straw cutting machine, sugar, J. Ma- Callejas y Becerra	Neves
re	Callejas y Becerra 843,479 Car and lecomotive, electric, C. de Kando. 842,957 Car brake mechanism, tram, G. J. Conaty. 843,262 Car construction, E. I. Dodds 842,869	Fabrics, device for cutting float threads of, J. Cunane
r- :h	Car construction, E. I. Dodds	Fan meter, S. C. Baucum 843,432 Fancy werk frame, C. Sander 843,495
g al	tiansen	Fancy work frame, C. Sander. 843,495 Feed bag, W. H. Rebinson 843,552 Fence gate, P. Mast 843,161 Fence machines, magazine for wire, O. S.
.a		
Эe	Car, electric tram, G. J. Cenaty. 843,261 Car frame, railway, W. F. Kiesel, Jr. 842,889 Car, gendela, E. I. Dedds. 842,871 Car grain door, railway, N. H. Cenger,	Fence post, M. C. Wix
		Fencing tie, wire, E. E. Tebias. 843,123 Fertilizer distributer, G. T. Vaughn 842,924 Fertilizer distributer, H. T. Yeungn 843,512 Fibreus steck feeder, S. W. Weedbury 843,126
y	Car leader, Kenner & Felkel	Filter, distributing machine for closed,
e e	E. I. Dedds	
n	Cars, bellows fold coupling for vestibule,	Fire alarm, Anderson & Harpster
ıl e	Cars, circuit closing mechanism for indicators on, T. W. Small 843,182 Cars, steel side stake for, E. I. Dodds. 842,868 Carbureter, E. L. Mueller 843,928 Carbureter, V. C. Severance. 843,112 Carbureter, J. R. Schrader 843,554 Carbureter, Soc. Hey convicer 843,554	E. H. McCloud
h	Cars, steel side stake for, E. I. Dodds 842.868 Carbureter, E. L. Mueller	Firearm, J. E. Mason
a.	Carbureter, J. R. Schrader	Fish net stake, E. J. Hopkins 843,339 Flanges, machine for attaching, W. W.
0	Castings, twin cupola process of making	Doolittle 843 198
3 -	semísteel, J. Č. Davis	Floor and laying same, T. Cantwell 843,193 Flue cutter, F. E. Shimer 843,499 Fluid pressure regulator, W. J. Richards 843,833 Flying machine, W. Morgan 843,476
s.	Chair, C. W. Hieber 843,208 Cheese cutter, L. Swank 842,919 Checelate coating machine, H. C. Remmers 843,300	
n	Chuck, J. Pearsen 843,095 Cigarette fermer, R. Hoffmann 842,886	Form, garment, C. Frankel 842,877 Form marker, bust, A. Waterman 843,378 Fowls, registering means for L. S. Linder 843,492
	Circuit catching device and electrical system for use in conjunction with the same, A. H. Graves	Frequency meter, W. H. Freedman
s İ	Circuit cleser, automatic, L. Charbonneau. 843,327 Clasp, W. H. Williamsen 842,987 Cleaning cylinder, retary, W. M. Krickbaum	Fewls, registering means for, L. S. Linder 843,923 Frequency sueter, W. H. Freedman. 843,267 Friction lock, W. A. Barker. 843,253 Fruit, skinning, J. B. Thompson. 843,311 Furnace, W. N. Best 843,254
e	Cleaning cylinder, retary, W. M. Krickbaum	
e	Clock winding mechanism, self-winding electric, H. W. Porter	Furniture, combination, J. L. McKensey. 843,547 Furniture spring, B. A. Chubbuck. 842,938 Fuse box, C. A. Rolfe 843,553 Gage. See Bailer gage
di¦ di	Cleth pressing machine buck, J. Ecker 843,331 Clethes line helder, L. Willeur 842,988	Gage. See Beller gage. Game beard, L. B. Sanferd. 843,037 Garment hanger, F. Bement 842,932
e	Clutch, friction, A. Master	Garters, etc., suspensory device for, S. Levitas
11	шапп	Garries, etc., suspensery device for, S. Levitas
i	Ceck, autematic steam and het water safety, J. A. Frey	Gas generator, acetylene, G. Laporte 842,962 Gas generator, acetylene, Babin & Colomb. 843,429
<u> </u>	Coffee, method of improving, A. E. B.	Gas light, H. W. Manning 843,474 Gas purifying materials, revivifying, H. L.
5	Gram 843,530 Cein helding and delivering machine, J. W. Meaker 843,224, 843,225	Deherty
	Cein register, L. J. Burdick	Gate hanger, C. A. Miller
	Collar, horse, W. B. Estes	Glass fastener, A. T. Moore
	Leitschuh	Gas purifying materials, revivilying, H. L. Deberty
1		Grave record, T. P. Pigg
i	Coloring matter, azo, Kahn & Kothe 843,149 Column, J. Lally 843,218 Column support, T. F. McCarthy 843,163	Gun stack jainted H W Munsan 843 227
e l	Combination lock, J. W. Raymond. 843,365 Compound engine, W. A. Webster 842,985	Guns, automatic extractor for detenating cartridges in breech leading, E. Olsson 843,231 Guns that recoil on their carriages, com-
,	Compression step and waste, A. C. Schuermann 843,496 Concrete and like material, reinforcing bar for, S. B. Williamson 843,424	
·	fer, S. B. Williamsen 843,424 Cencrete mixer, G. E. McArthur 842,902 Cencrete mixer, E. E. Jacksen 843,278	pressed air brake 10t, J. A. Depert. 843,522 Hand shield, L. B. Tebeau. 843,445 Harp action, C. A. Lindeman 843,470 Harrows, adjusting lever and ratchet connection for, G. E. Blaine 842,996 Harvester, beet, W. H. McCall 843,412 Harvester, cotton, D. Murphy 843,546 Harvester grain lifting attachment, A. H. McCutchan 843,164
3	Condiment holder, compound, L. B. Parker. 843,356	nection for, G. E. Blaine 842,996 Harvester, beet, W. H. McCall 843,412
• [']	Cenveyer, Merenus & Jenes	Harvester grain lifting attachment, A. H. McCutchan 843 164
3	Conveyer for excavating, I. J. Smith	McCutchan 843,164 Hasp fastener, C. S. Morse 843,350 Hasp lock, P. Grabler 843,564
1	H. Kuhsiek	Hay and grain leader, unleader, and stacker, A. Lage 843,539 Hay carrier, J. R. Cembs 843,328 Hay rake, herse, A. F. Kearns 843,150 Header, W. Jacebs 843,279 Heat revolcting apparatus N. F. Noch 842,002
5	Cotton chopper and cultivator, combined, Robertson & Jones	Hay carrier, J. R. Combs
• i	Cetten chepping and scraping machine, J. Nelson	Head regulating apparatus, N. E. Nash. 843,093 Heat regulating apparatus, N. E. Nash. 843,093 Heater, H. J. Lange
8 •	Cetten gathering apparatus, J. F. O'Shaughnessy 843,294 Couch felding, J. Feldman 842,876	Heating apparatus. S. H. Garst
8 4	Couch, folding, J. Feldman 842,876 Counterboring tool, V. Bail 843,430 Crane, overhead traveling, C. L. Taylor. 843,121 Crank joint, double, W. L. Morrow. 843,990 Crushing and pulverizing machine, J. Ancel 843,428 Cultivator attachment, H. Oppe. 843,031 Cultivator, tengueless, C. E. Macbeth. 843,163 Currisin pale & Gerbeiser.	Hemmer, A. L. Madison 843,347 Hinge, W. H. Fitzgerald 843,081
5 ● ;	Crank joint, double, W. L. Morrow 843,090 Crushing and pulverizing machine, J. Ancel 843,428	Hinge pin and joint, R. G. Schutz 843,938 Hitching weight, I. Matsumete 843,543
•	Cultivator, tengueless, C. E. Macheth 843,160 (Cultivator, pela C. Gerheiser 843,008)	Heister drum with hellew shafts, A. Lambert 843,154
6 3	Curtain pele, G. Gerheiser 843,008 Cuspider, J. Knapp 843,215 Cutter head, E. S. Shimer 843,498	Hoisting apparatus, F. D. Millin 843,411 Hoisting apparatus, V. R. & E. H.
3	Cutter head, E. S. Shimer 843,498 Cutting apparatus, A. A. Gardner 843,142 Cutting bit, eccentrical, Tembragel &	Brewning 843,558 Hoek, W. O. Bement 842,933 Herse, adjustable folding, T. V. Struble. 843,118
8	Schunder	Hose supporter, J. H. Stoltzfus 843,115 Hot air furnace, C. F. A. Roell 843,104
1	Dental bur and excavator, W. Homann 843.273	Het water circulating system, C. C. Peck
7 ●	Derailer, S. W. Hayes	Hull cleaning and friction reducing apparatus, Partee & Wharton \$43.357 Hydraulic press, B. Gerdau \$42.949 Impact and reaction motor, C. Comstock. 843.973
1	Derrick, leading, N. H. Nelsen 842,904 Dipper, C. F. Smith 843,372 Disinfector for water closets, W. H. Ermen-	Impact and reaction meter, C. Comstock. 843,973 Incubator, W. F. Mikelasek
3	treut	Index, changeable, C. Townsend 843,124
9		mer
6	Display bex, C. C. Rahn 843,191 Display bex, C. C. Rahn 843,364 Display package, H. C. Schultz 843,419 Display rack, E. B. Westen 842,929 Display rack, A. B. Lesee 843,292 Distilling apparatus, H. A. Abendreth 843,396 Dock, W. E. Overton 843,318 Deer, for five departments and expent there.	Innersole inising apparatus, G. E. Rollins
1	Display rack, A. B. Lesee	Insulator, W. G. Clark 842.941, 843,259 Insulator clamp, W. G. Clark
4	Distilling apparatus, H. A. Abendreth 843,318 Dock, W. E. Overton 843,355	Insulator clamp, W. G. Clark 843,258 Insulator, wire, W. G. Clark 842,942 Insulators, making, L. McCarthy 843,352
9	Door for fire departments and opener therefor, folding, Hale & Fox	Insulators, making, L. McCarthy 843,352 Intrenching tool, G. B. Rodney 843,179 Iron and steel, treatment of, H. Lucken-
4	for, felding, Hale & Fox	bach 843,569 Ir•n, manufacture •f articles fr•m cast, A. E. •uterbridge, Jr. 842,9•6
* ;	Doors, windows and the like, fastener for, E. W. F. Sachse	Ironing board, L. C. Krans 843,400 Isinglass, packing, A. L. Canfield 843,325
Э	Drawer, G. W. Andress	Knitting machine, H. U. Aberle 842,931 Knob attachment, M. Weber 843,952
1	Drilling machine, C. Ridderhof 842,977 Dumning apparatus sutematic R Z	Irening beard, L. C. Krans. 843,400 Isinglass, packing, A. L. Canfield. 843,325 Knitting machine, H. C. Aberle 842,931 Knob attachment, M. Weber 843,052 Lace helder, shee, J. P. Olsen 843,485 Lace machine carris, s, machine for threading and unthreading, Pare & Richmond. 843,487 Ladder, extension, J. R. Goddard. 843,294 Lamp apparatus for vehicles, G. C. Pyle. 843,298 Lamp attaching means, electric, Wilson &
2	Drilling machine, C. Ridderhof 842,977 Dumping apparatus, automatic, R. Z. McCoy State Control of the McCoy State S	Ladder, extension, J. R. Goddard
7	Duster, feather, J. E. Snevely843,113, 843,114 Dye, azo, Dressel & Kahn843,413, 843.077	Lamp attaching means, electric, Wilsen & Geedwin 843,316 Lamp, incandescent electric, W. R. Whitney 843,054
9 0 i	Dye, aze, Dressel & Kahn 843,077 Dye, aze, Dressel & Ossenbeck 843,137 Dye, green sulfur, A. L. Laska 843,156	Lamp, incandescent electric, W. R. Whitney 843,054 Lamp, induction vapor or gas electric, P.
6	Dyname machines, parallel running et, Parsens & Steney	Lamp, induction vapor or gas electric, P. C. Hewitt 843,533 Lamp safety closing device, miner's, A. L. Tombelaine 843,505
3 5 5	Eggs, cream, vegetables, etc., beater, mixer, and masher for. W. Sturma 843.309	Keier 843,281
8	Eggs, cream, vegetables, etc., beater, mixer, and masher for, W. Sturma. 843.309 Electric heater, A. N. Anderson. \$42,849 Electric lights, producing, P. C. Hewitt. 843.534	Lamp socket, incandescent, Thomas & Good- ridge
<u>3</u> :	Electric machine, dynamo, M. C. A. Latour 642,905	Lamp socket, incandescent, F. Wunder- lich 843,425
4	paratus, operating, R. D. Mershon 842,966 Electric motors, ventilation of G. Gibbs, 842,051	Latch mechanism, knob operable, H. G. Voight Lathe, G. E. Greenleaf
2	Electric meters, generators, and other apparatus, operating, R. D. Mersbon. 842,966 Electric meters, ventilation of, G. Gibbs. 842,951 Electric signal, C. L. Krum. 843,283 Electric switch, automatic, W. F. Irish. 843,276 Electric time switch, automatic, L. C. Der-	H. A. Desper
		Leer, S. F. Field 843,264 Leg form, G. M. Luce 843,221
6 7	Electric tram system, O. J. Davy 843,520 Electrical contact apparatus, J. C. Boyd 842,852	Lever jack, A. A. McIntosh 843,048

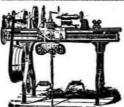
FEBRUARY IO, 1907.	_
Life line projecting device, B. Behr Lifter, Whaleck & Becker	843,385 843,509
Life line projecting device, B. Behr Lifter, Whileck & Becker Lifter or holder, F. W. Pew Lime, treating, M. R. Isaacs Linetype mold, B. Van Wie Leader, J. E. Wallin Lock and latch, H. G. Voight Locomotive exhaust nozzle, J. B. Allfree. Locomotive superheater, H. V. Wille Loom filling detecting mechanism, J. V.	842,909 843,277 843,241 842,925
Lock and latch, H. G. Voight Locemotive exhaust nozzle, J. B. Allfree	842,925 843,048 843,252 843,315
Locomotive superheater, H. V. Wille Locom filling detecting mechanism, J. V.	843,315 843,196
Ouniff Loom filling exhaustion indicating mechanism, Wood & Northrop Loom filling replenishing mechanism, automatic, Northrop & Reper Loom for weaving tufted fabrics, E. Panswowski	843,249
tematic, Northrep & Reper Leem for weaving tufted fabrics, E. Paruszewski	843,169 843,358
Leem, lappet, W. A. Rebinsen843,177, Leem let eff mechanism, C. F. Reper Leem pretector and smash preventing mech-	843,178 843,181
anism, R. Crempten	842,944 843,107 843,366 843,536
Leem for weaving tuffed fabrics, E. Paruszewski Leem, lappet, W. A. Rebinsen 843,177, Leem let eff mechanism, C. F. Reper Leem protector and smash preventing mechanism, R. Crempten Leem, weft replenishing, W. F. Reper Lubricator, Reber & Clark Lubricator, G. W. Ingham Machine driven ventilator, C. Jest Mail bag catcher and deliverer, C. W. Bell	843,536 843,398
Mail bag catching and delivering device, M. D. Cummings	843,433 843,560
Mail crane, M. Laska Mail deliverer, N. K. Bowman Mail sack catching and delivering apparatus,	843,467 843,129
Manipulater, J. W. Weber Mantle support, F. E. Reichardt	843,561 843,422 842,975
Marker and trip actuator, ground, F. H. Morse Mask, A. Otto Match safe: C. H. Levering	\$43,162 \$43,486 843,405
Machine driven ventifater, C. Jost. Mail bag catching and deliverer, C. W. Bell Mail bag catching and delivering device, M. D. Cummings Mail crane, M. Laska Mail deliverer, N. K. Bewman Mail sack catching and delivering apparatus, M. D. Cummings Manipulater, J. W. Weber Mantle support, F. E. Reichardt. Marker and trip actuater, ground, F. H. Morse Messe Match safe, C. H. Levering Measuring instrument, G. M. Willis Measuring instrument, optical reading device for electrical, E. F. Northep. Meat smeking apparatus, C. Schmitt Merry-ge-rounds, gear for, W. F. Mangels. Metallist tie and rail fastener, H. W. Mulvey Metallist device, L. G. Harner	843,189 843,414
Meat smeking apparatus, C. Schmitt Mechanical mevement, A. Sack Merry-ge-rounds, gear fer. W. F. Mangels.	843,414 843,368 843,110 843,406
Metal structural work, R. T. Lewis Metallic tie and rail fastener, H. W. Mul- vey	842,894 843,351
Milking device, L. G. Harper Milking device, cow, M. H. Daniels Mixer, W. Dicks	843,532 843,446 843,136
Mixing and kneading machine, C. Laurick Moistening and delivering gummed binding tape, device for, H. P. Roberts	843,468 843,101
Money changing machine, E. D. Hale Motor meter for alternating currents and operating the same, R. C. Lanphier	842,885
Multipolar service switch, H. R. Sargent Nail clipper, A. M. Wooster Necktie holder, F. Schlecht	842,978 843,383 843,303
mals, A. L. Hodge Nut and bolt lock, J. A. Hyle	843,211 843,147
Nut for vehicle hubs, lock, W. F. Post Nut lock, Garrison & Bosserman	843,271 843,096 842,880
Metalls tructural work, R. T. Lewis. Metallic tie and rail fastener, H. W. Mul- vey Milking device, cow, M. H. Daniels Mixer, W. Dieks Mixing and kneading machine, C. Laurick. Moistening and delivering gummed binding tape, device for, H. P. Roberts. Money changing machine, E. D. Hale. Money changing machine, E. D. Hale. Motor meter for alternating currents and operating the same, R. C. Lanphier. Nail clipper, A. M. Wooster Nose bag for feeding horses and other ani- mals, A. L. Hedge Nut and belt lock, J. A. Hyle Nut, expansion, J. S. Hanlen Nut lock, G. C. Chaddeck Nut lock, D. C. Chaddeck Nut lock, D. C. Chaddeck Nut lock, M. S. Mason Oar lock and socket therefor, Lackie & Pos- ten Oil and steam vaper burner and steam gen- erater combined, hydrocarbon, A. J. Smithsen	842,937 843,407 843,021
Oil and steam vaper burner and steam gen- erator combined, hydrocarbon, A. J. Smithson	842.917
Oil burner, G. E. Witt	843,381
Themsen Optemeter, W. & A. G. Themsen Ore separater, L. B. Hunter	843,502 843,503 843,086
Overcheck runner and gag helder, H. M. Applegate Packing machine, E. L. Bracy	842,992 843,323
Packing, paste, J. Whitcomb	843,187 842,858
Paper and fabric rells, core for, C. L. Crane Paper and the like rack, tissue, W. A.	842,862
Blackman Paper cutting and perforating machine, S. Wheeler	843,387 842,986
oiling device, Grieser & Yates. Optical instrument eyepiece, W. & A. G. Thomson Optometer, W. & A. G. Thomson. Ore separator, L. B. Hunter Overcheck runner and gag holder, H. M. Applegate Packing machine, E. L. Bracy Packing, metallic, F. McCarthy. Packing, metallic, F. McCarthy. Packing, paste, J. Whitcomb Paint line and awl holder, W. N. Cavileer. Pan. See Dust pan. Paper and fabric rells, core for, C. L. Crane Blackman Paper and the like rack, tissue, W. A. Blackman Paper cutting and perforating machine, S. Wheeler Paper fastener, G. Boden Paper fastener, J. P. Stelle Paper folding machine, S. Lazar Paper holder and cutter, roll, F. Kaufman Paper or bag holder, G. S. Priddy.	843,128 843,184 843,219
Paper holder and cutter, reil, F. Kauf- man Paper er bag helder, G. S. Priddy. Paper shaping machine, C. H. Dunning. Patrel station bex, A. A. Newman. Pattern plates, apparatus for making, P. Benvillian Pelts, machine for removing water hairs from, G. Cimietti Pen, non-leakable fountain, C. A. Hay- ward Physical development appliance, A. P. Mul- lins	842,959 843,363 843,138 843,293
Pattern plates, apparatus for making, P. Bonvillian Pelts, machine for removing water hairs	843,066
frem, G. Cimietti Pen, nen-leakable feuntain, C. A. Hay-ward	842,939 843,338
Physical development appliance, A. P. Mullins Piano player, mechanical, J. Rowley	843,291 843,108
Pick, W. Thederf Pie pan, B. C. Sabin Pile, sheet, F. W. Skinner	842,920 843,109 843,307
Pincushion, G. D. Merrill Pipe joint, J. C. McElroy Piping for circulating systems, system of,	843,408 843,165
Pistel, repeating cap, H. Bennett	843,064
Planing machine, T. A. Warner	843,244
Physical development appliance, A. P. Mullins Piane player, mechanical, J. Rewley Pick, W. Thederf Pie pan, B. C. Sabin Pile, sheet, F. W. Skinner Pincushien, G. D. Merrill Pipe jeint, J. C. McElrey Piping for circulating systems, system of, J. C. Kitten Pistel, repeating cap, H. Bennett Pistels, connecting rod for trunk, H. Dock Planing machine, T. A. Warner. Planing machine attachment, P. J. Mc- Cormick Planter, W. H. Heisclaw Planter, corn, Jenes & Tewle Planter, corn, Jenes & Tewle Plaw, greeving and ditching, W. M. Bensen Pley, R. Sulffacts W. M. G. Cormon, M. Bensen Pley, greeving and ditching, W. M. Bensen	843,457 843,500 843,020
Plew, H. F. Brussew Plew, greeving and ditching, W. M. Bensen	843,345 843,257 843,386
Plew, H. F. Brussew Plew, greeving and ditching, W. M. Bensen Plew or cultivater, W. T. Geerge. Pele, H. Pettersen Pestal card pretector, H. Ohashi. Pewder bex, J. A. Bucke. Pewer transmission mechanism, R. H. Little	843,393 843,171 843,416
Power transmission mechanism, R. H. Little Power transmitting mechanism, R. Hamil-	843,286
Power transmitting mechanism, R. Hamilton Pressure controlling system, M. G. Reynolds Printing block, L. McGovern Printing machines, front stop-operating mechanism for, G. F. Read. Printing plate helder, J. A. Corey. Printing press, J. W. Hoag. Projectile, G. H. Hoxie Pulley, split, H. M. Frank Pully screening machines, cleansing the screens of, P. R. Them Pulverizer and smeether, soil, F. Miller. Pump governor, G. E. Witt Puzzle, J. M. Pusey Pyrotechnic device, E. H. Wagner. Quilting frame, W. F. Gaines. Rack. See Display rack. Radiators, hot air defector and dust col- lector for, C. E. Schafer Rail joint, A. W. Shaw Pall joint, A. W. Shaw Pall sint, J. I. Covering.	\$43,013 843,174 843,483
Printing machines, front step-operating mechanism for, G. F. Read Printing plate holder, J. A. Corey	842,974 843,0 0 2
Printing press, J. W. Hoag	843,535 843,017 843,2 0 2
Pulp screening machines, cleaning the screens of, P. R. Thom Pulverizer and smoother, soil, F. Miller	843,185 843,025
Puzzle, A. Bragg Puzzle, J. M. Pusey Pyretechnic device, E. H. Wagner	843,388 843,490 843,125
Quilting frame, W. F. Gaines	843,269
lector for, C. E. Schafer	842,914 842,915 843,135
Rail joint, A. W. Shaw Rail joint, J. J. Cousins Rail joint, J. L. Mertins Rail joint, D. B. Begare Rail jeint, D. B. Begare Rail tie, metallic, W. G. Martan Rails, anticreeping attachment for, T. L.	843,409 843,557 843,475
Railway gate, W. Lambert	843,232 842,892 843,335
Railway joint, R. B. Swank843,119, Railway switch, T. K. Wilson	843,120 842,930 843,200
Railway tie, W. H. Castle	843,517 843,492 842,967
Railway train safety device, D. Kerekes Railway with suspended vehicle, single rail electric everhead, H. Remaneff	843,463 843,418
Ratchet drill, J. H. & T. M. Aiken Razer, safety, A. A. Warner842,927, Razer, safety, F. Kampfe	843,513 842,928 842,956
Rails, anticreeping attachment for, T. L. Paine Railway gate, W. Lambert Railway gate, automatic, L. Gallant Railway gate, automatic, L. Gallant Railway joint, R. B. Swank Railway switch, T. K. Wilson Railway tie, H. G. Staab Railway tie, W. H. Castle Railway tie, wetal, A. O. Ridgway Railway train safety device, D. Kerekes Railway with suspended vehicle, single rail electric overhead, H. Romanoff Ratchet drill, J. H. & T. M. Aiken Razor, safety, F. Kampfe Razor, safety, F. Kampfe Razor, safety, A. H. Jackson Razor strep members, swivel device for, F. Kampfe	843,059 843,148 842,241
Kampfe	- 10,011



"Star" Food and Power Cutting utomatic Cross Feed Lathes

FOR FINE, ACCURATE WORK Send for Catalogue B.
SENECA FALLS MFG. CO. 695 Water Street, Seneca Falls, N. Y., U. S. A.

Engine and Foot Lathes
MACHINE SHOP OUTFITS, TOOLS AND
SUPPLIES. BEST MATERIALS. BEST
WORKMANSHIP. CATALOGUE FREE
SEBASTIAN LATHE CO., 120 Culvert St., Cincinnati. 0-



GUNSMITHS, TOOL MAKERS, EXPERI-MENTAL & REPAIR

WORK, ETC.
From 9-in. to 13-in. swing.
Arranged for Steam or
Foot Power, Velocipede
or Stand-up Treadle.
Send for Lathe Catalog. W.F. & JNO. BARNES CO.
Established 1872.
1999 Ruby St., Rockford, LL.

A GOOD INVESTMENT we will send by express (not prepaid), complete N. D. Outfit with full instruc-tions for learning TELEGRAPH OPERATING.

A fascinating study that will enable you to earn good wages Send for our catalog. Established 1879. J. H. BUNNELL & Co., Inc. 20 Park Place, New York

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

Saving Energy

means much in these strenuous days. That is why

Telephone Service

is so helpful in both home and office.

NEW YORK TELEPHONE CO. 15 Dey Street.



A MONEY MAKER Hollow Concrete Building Blocks Best. Fastest. Simplest, Cheapest Machine. Fully guaranteed. THE PETTYJOHN CO. 615 N. 6th Street, Terre Haute, Ind.

Keystone Well Drills



GOODELL GO No Fooling Hround

Business is business with our HACK-SAW BLADES

They can always be found "on the job." They are thin and hard, built for use in rapid work—very rapid. Finest hot-rolled sheet steel used in their manufacture. For prices and sizes, see our catalogue. GOODELL-PRATT COMPANY Greenfield, Mass.

Asbestos and Magnesia Products STEAM PIPE AND BOILER COVERINGS. ASBESTOS PACKING (For all purposes). ASBESTOS FIRE RESISTING CEMENTS. ASBESTOS BUILDING MATERIALS. "J-M" ASBESTOS RODFING. ASBESTOS FABRICS. KEYSTONE HAIR INSULATOR. ELECTRICAL SUPPLIES.

W. JOHNS-MANVILLE CO. New York, Milwaukee. Chicago, Boston, Philadelphia, St. Louis, Pittsburg, Cleveland, New Orleans, Kansas City, Minneapolis, San Francisco, Los Angeles. Seattle. London.



Marine, Stationary, Portable NO DANGER, Maximum Power, Lightest Weight. Simple. Reliable, Economical. No Batteries, Self Ignition by Compression. Fully guaranteed. Write for Catalogue S. A. 127 No charge for packing. INTERNATIONAL OIL ENGINE CO. 38 Murray St., New York, U.S. A.

Kerosene Oil Engines J. LLEWELLYN KING SHIPBUILDER

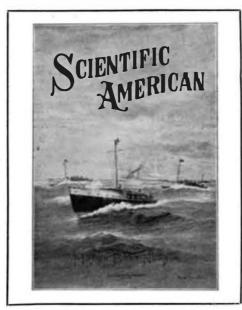
ELIZABETHPORT, N. J., U.S.A. Builder of Stern Wheel, Paddle and Screw Steamers, Torpedo Boats and Barges of all kinds in Steel. DD A Specialty made of South American and Alaskan River Boats, Launches, Dories, Canoes, Etc.

-The=

MOTOR BOAT NUMBER SCIENTIFIC AMERICAN

Lavishly Illustrated (Price 10 Cents) Handsome Cover

UR Motor Boat Special, which will issue February 23, during the Motor Boat Show, will contain all that is new in this growing industry and sport. Some of the fastest



of the American and Foreign motor boats and their engines will be illustrated and described. Plans and descriptions of comfortable cruisers and pleasure boats for the ordinary user will also be published. A prominent feature will be an article telling what has been accomplished the past year with the new type of gliding boat for which much was prophesied in our last motor boat number. There will be many novelties which will appeal

to the motor boat user, and the issue will undoubtedly reach a large number of people interested in launches, yachts and racing motor boats.

MUNN & COMPANY **PUBLISHERS** SCIENTIFIC AMERICAN OFFICE 361 BROADWAY

	Receptacle for elements, Porscke & Wede- kind
1	Macdonald
nuch in these	Register name beard, F. W. Leuthesser 843,285 Ridge rell machine, C. F. Baldwin 842,994 Read bed equipment, J. D. Kneedler 843,216
s days. That	Rock drill, Hellman & Bayles 842,953 Rock drill saddle, G. S. Power 842,972
ne l	Receptacle for elements, Porscke & Wede- kind 843,549 Recorder and reproducer, combined, T. H. Macdonald 842,897 Refrigerater, J. Staudacher 843,045 Register name board, F. W. Leuthesser 843,055 Register name board, F. W. Leuthesser 843,285 Ridge rell machine, C. F. Baldwin 842,994 Read bed equipment, J. D. Kneedler 843,265 Read smoother, R. C. Schreiber 843,369 Reck drill, Hellman & Bayles 842,953 Reck drill saddle, G. S. Pewer 842,972 Rock drilling engine, multiple hammer piston, J. G. Leyner 843,159 Reck drilling engines, lock for feed screws for, F. E. Glaze 843,144
lpful in both	fer, F. E. Glaze 843,144 Recking chair, J. C. Arenhalt 843,060 Relling mills, mechanism for handling metal in, A. J. Heak 843,395
d office.	Kools or slaings, angle piece for, J. H.
TELEPHONE CO. by Street.	Rubber, extracting, G. B. Bradshaw843,567 Rubber footwear, mold for manufacturing, M. C. Clark
	Helt
MONEY MAKER w Concrete Building Blocks Fastest, Simplest, Cheapest ine. Fully guaranteed.	Ruler and sliding scale, relling parallel, G. B. Sturgeen 843,374 Saddle bags, A. R. Meere 843,349
ine. Fully guaranteed. IE PETTYJOHN CO. 6th Street, Terre Haute, Ind.	Safe, W. C. Hattersley 843,272 Salt shaker, O. Kampfe 843,280 Sandpapering machine. J. Gramelspacher. 843,010
Well Drills	B. Sturgeen
for Artesian and Ordinary Water	
Wells; Mineral Prospecting and Placer Testing for Dredgers; Deep Drilling for Oil and Gas; Contractor's Blast Hole Drilling,	Sawdinst drier, C. E. Smith
River and Harbor Exploration- etc. Our five catalogs are text, books in these lines.	Scissors, E. C. Higgins 843,209 Scoop and shovel grip, C. J. Rundell 842,912 Screw gage and the like, F. B. Fischer 843,265
KEYSTONE WELL WORKS Beaver Falls, Pa.	Scrubber or cleaner, W. B. Rohmer
DELL	Sewer trap, G. G. Burdick 843,069 Sewing machine, Bolton & Weiss 842,934 Sewing machine, J. R. Reynolds 843,069 843,069 843,069
ng Around	H. Burrage
W BLADES	Shaft coupling, H. M. Frank 843,201 Shaft holder for harness, W. T. Sebree 843,041 Shaft negree at J. R. Carwell 942,449
"on the job." They are thin in rapid work—very rapid. teel used in their manufacture catalogue.	Sharpening apparatus. file, J. M. Gale 843,742 Sheet metal spinning apparatus, R. Clarke. 843,518 Ship for corrying liquid corrects in bulb
NY Greenfield, Mass.	C. E. Burney 843,390 Ship's hull, O. Helby 843,016 Shae nolishing device G R Dunn 843,562
Products	Saw guide, band, H. J. Rathke
SBESTOS ROOFING. OS FABRICS. NE HAIR INSULATOR.	Shutter operating device, A. K. Lovell,
CO.	Sign, electric, G. Hewe \$42.954 Sign, enameled, E. Richardson \$43,235 Sign, lumineus, P. L. Clark \$42,860 Sign or indicator, changeable, Fuller \$482.968
eland, New Orleans, Kansas ondon.	
I I VN VINC	Signaling system, electric, F. W. Prentice. 843,550 Skirt supporter, W. Klinge
LLYN KING UILDER	Siffeer, petate, Atkinsen & Teate
RT, N. J., U. S. A.	Signali. See Electric signal. Signaling system, electric, F. W. Prentice. 843,550 Skirt supporter, W. Klinge
heel, Paddle and Screw Boats and Barges of all	Speed transmission mechanism, variable, A. V. Hart Spinning machine, J. G. Fabr 843,448 Spinning of textile fibers, means for facilitating the, R. Todd, et al. 842,921 Spiral cutting machine, R. T. Wingo 842,989 Spool, P. Hardman 843,454 Spool, P. Hardman 843,454 Spring wheel, M. Murray 843,228 Springs, bearing end for half elliptic, T. A. Shea 843,306
A Specialty made of and Alaskan River Dories, Canoes, Etc.	tating the, R. Todd, et al
	Speel helder and pretecter, Kasse & Stell. 842,958 Spring wheel, M. Murray
	Shea 843,306 Sprinkler closer, automatic, G. Boden. 843,556 Spud, C. E. Root 843,036
JMBER	Stacker, straw, E. & F. Barth 843,063 Stair red fastener, L. Deitrick 843,521 Stalk puller, C. J. Richardsen 843,493
	Steam generator, J. Schutte 843,494 Steam trap, R. C. Johnston 843,019 Steam trap, G. W. Hayden 843,207 Steam trap, J. Laparide 842,207
RICAN	Steaming apparatus. W. G. Williams 843,510 Steel, iron, and other metals, toughening other metals, toughening w. F. Frield
	Steaming apparatus. W. G. Williams
shly Illustrated	Steaming apparatus W. G. Williams \$43,510 Steel, iren, and ether metals, teughening et annealing, W. F. L. Frith \$43,563 Sterilizing er pasteurizing apparatus, attachment fer, C. J. Tagliabne \$42,981 Stethescope, P. A. Aurness \$43,319 Still, continuous, E. Krepper \$43,217 Steker, autematic, J. S. S. Fulten \$42,878 Stene gallery, G. W. Dever \$43,006
thly Illustrated ue February 23,	Steaming apparatus W. G. Williams \$43,510 Steel, iren, and ether metals, teughening er annealing, W. F. L. Frith \$43,563 Sterilizing er pasteurizing apparatus, at- tachment fer, C. J. Tagliabue \$42,981 Stethescope, P. A. Aurness \$43,319 Still, continuous, E. Krepper \$43,217 Steker, autematic, J. S. S. Fulten \$42,878 Stene gallery, G. W. Dever \$43,006 Steve, M. W. Barker \$42,995 Steve flue, E. E. Thempsen \$43,375 Steve grate, recker, F. B. Watsen \$43,051
ue February 23, ontain all that is	Steaming apparatus. W. G. Williams 843,510 Steel, iron, and other metals, teughening or annealing, W. F. L. Frith 843,563 Sterilizing or pasteurizing apparatus, at- tachment for, C. J. Tagliabue 842,981 Stethoscope, P. A. Aurness 843,319 Still, continuous, E. Krepper 842,217 Stoker, automatic, J. S. S. Fulton 842,878 Stone gallery, G. W. Dover 843,006 Stove flue, E. E. Thompson 843,375 Stove flue, E. E. Thompson 843,051 Stove, heating, C. F. A. Roell 843,103 Stove, magazine, C. F. A. Roell 843,103 Stove, magazine, C. F. A. Roell 843,106 Strip serving device, E. Elliett 842,948
ue February 23, ontain all that is	Steaming apparatus W G. Williams \$43,510 Steel, iren, and ether metals, toughening er annealing, W. F. L. Frith \$43,563 Sterilizing er pasteurizing apparatus, attachment fer, C. J. Tagliabue \$42,981 Stethescope, P. A. Aurness \$43,319 Still, continuous, E. Krepper \$43,217 Steker, autematic, J. S. S. Fulten \$42,878 Stene gallery, G. W. Dever \$43,006 Steve, M. W. Barker \$42,995 Steve field, E. E. Thempsen \$43,375 Steve grate, recker, F. B. Watsen \$43,051 Steve, heating, C. F. A. Reell \$43,103 Steve, magazine, C. F. A. Reell \$43,103 Steve, magazine, C. F. A. Reell \$42,948 Superheater, H. Langer \$43,342 Surface indicater, J. Sigrist \$43,043 Surgical ligatures, container fer, H. Resen-
ue February 23, ontain all that is	Spring wheel, M. Murray \$43,228 Springs, bearing end for half elliptic. T. A. Shea \$43,306 Sprinkler closer, automatic, G. Boden \$43,356 Sprinkler closer, automatic, G. Boden \$43,036 Stacker, straw, E. & F. Barth \$43,063 Stacker, straw, E. & F. Barth \$43,063 Stair red fastener, L. Deitrick \$43,406 Stair red fastener, L. Deitrick \$43,497 Steam trap, G. W. Hayden \$43,497 Steam trap, G. W. Hayden \$43,207 Steam trap, G. W. Hayden \$43,207 Steam trap, J. Langridge \$43,402 Steaming apparatus. W. G. Williams \$43,563 Steel, iron, and ether metals, teughening or annealing, W. F. L. Frith \$43,563 Sterilizing or pasteurizing apparatus, attachment for, C. J. Tagliabue \$42,963 Sterilizing or pasteurizing apparatus, attachment for, C. J. Tagliabue \$43,319 Still, continuous, E. Krepper \$43,217 Steker, automatic, J. S. S. Fulton \$42,985 Steve, Bucker, automatic, J. S. S. Fulton \$43,006 Steve, M. W. Barker \$42,995 Steve grate, recker, F. B. Watson \$43,006 Steve, pasting, C. F. A. Roell \$43,007 Stove, beating, C. F. A. Roell \$43,103 Stove, magazine, C. F. A. Roell \$43,103 Stove, magazine, C. F. A. Roell \$43,342 Surfical ligatures, container for, H. Rosenberg \$43,447 Strip serving device, E. Elliett \$42,948 Superheater, H. Langer \$43,342 Surfical ligatures, container for, H. Rosenberg \$43,473 Strip serving device, J. N. Makely, et al. \$43,473 Strip serving device, J. N. Makely, et al. \$43,473 Strip serving device, J. N. Makely, et al. \$43,473 Strip serving device, J. N. Makely, et al. \$43,473 Strip serving device, J. N. Makely, et al. \$43,473 Strip serving device, J. N. Makely, et al. \$43,473 Strip serving device, J. N. Makely, et al. \$43,473 Strip serving device, J. N. Makely, et al. \$43,473 Strip serving device, J. N. Makely, et al. \$43,473 S
ue February 23, ontain all that is	Steaming apparatus W G. Williams \$43,510 Steel, iron, and other metals, toughening or annealing, W. F. L. Frith \$43,563 Sterilizing or pasteurizing apparatus, at tachment for, C. J. Tagliabue \$42,981 Stethescope, P. A. Aurness \$43,319 Still, continuous, E. Krepper \$43,217 Steker, automatic, J. S. S. Fulton \$42,878 Stone gallery, G. W. Dover \$43,006 Stove, M. W. Barker \$42,995 Stove flue, E. E. Thompsen \$43,375 Stove grate, rocker, F. B. Watson \$43,035 Stove, heating, C. F. A. Roell \$43,106 Strip serving device, E. Ellistt \$42,948 Superheater, H. Langer \$43,342 Surface indicator, J. Sigrist \$43,043 Surgical ligatures, container for, H. Rosen- berg Switch operating mechanism, T. E. Button \$43,070 Switching device, J. N. Makely, et al. \$43,473 Synchronizer, W. H. Freedman \$43,266 Talking machine, C. Thomas \$42,982, 842,983 Talking machine sound box, F. Sheppy \$43,042 Tank indicator W. H. Menter \$43,666
ue February 23, ontain all that is	Steaming apparatus W. G. Williams \$43,510
ue February 23, ontain all that is	Steaming apparatus W. G. Williams
ue February 23, ontain all that is	Steaming apparatus W. G. Williams
ue February 23, ontain all that is	Steaming apparatus W. G. Williams
ue February 23, ontain all that is	Steaming apparatus W G. Williams
ue February 23, ontain all that is	Steaming apparatus W. G. Williams
ue February 23, ontain all that is	Steaming apparatus W. G. Williams
ue February 23, ontain all that is	Steaming apparatus W. G. Williams
ue February 23, ontain all that is	Steaming apparatus W. G. Williams
ue February 23, ontain all that is	Steaming apparatus W. G. Williams
ue February 23, ontain all that is	Steening apparatus W G. Williams
ue February 23, ontain all that is	Steaming apparatus W. G. Williams
ue February 23, ontain all that is	Steaming apparatus W. G. Williams
the February 23, ontain all that is me of the fastest nerican and Formal beauth of the illustrated ibed. Plans and is of comfortable in depleasure boats dinary user will blished. A promoure will be an illing what has implished the past the new type of the past the new type of the past in motor boat numbers will be many which will appeal adoubtedly reach thes, yachts and	Switching device, J. N. Makely, et al. 843,473 843,473 Synchronizer, W. H. Freedman 843,266 Talking machine, C. Thomas 842,982 842,983 Talking machine, cound box, F. Sheppy 843,042 Tank indicator, W. H. McNutt 843,166 Teapets, etc., dripless speut for, W. Cox. 843,443 Telegraph, printing, J. D. White 843,508 Telegraph, printing, E. J. Steljes. 842,918 Telephone dictating machine or apparatus, Turner & Germer 843,186 Telephone relay or repeater, A. L. Parcelle 843,296 Telephone system, R. M. Eaton 843,078 Telephone system, R. M. Eaton 843,078 Telephone system, R. M. Eaton 843,329 Telephone system, R. M. Eaton 843,329 Telephone trunking system, H. G. Webster 843,322 Telephone trunking system, H. G. Webster 843,326 Telephone trunking system, H. G. Webster 843,326 Thimble forming machine, F. A. Christensen, et al. 843,000 Thread guard, S. B. Wilsen 843,190 Three See Fencing tie. 843,190 Time recorder, J. G. Wynn 842,990
the February 23, ontain all that is me of the fastest nerican and Formal beauth of the illustrated ibed. Plans and is of comfortable in depleasure boats dinary user will blished. A promoure will be an illing what has implished the past the new type of the past the new type of the past in motor boat numbers will be many which will appeal adoubtedly reach thes, yachts and	Switching device, J. N. Makely, et al. 843,473 843,473 Synchronizer, W. H. Freedman 843,266 Talking machine, C. Thomas 842,982 842,983 Talking machine, cound box, F. Sheppy 843,042 Tank indicator, W. H. McNutt 843,166 Teapets, etc., dripless speut for, W. Cox. 843,443 Telegraph, printing, J. D. White 843,508 Telegraph, printing, E. J. Steljes. 842,918 Telephone dictating machine or apparatus, Turner & Germer 843,186 Telephone relay or repeater, A. L. Parcelle 843,296 Telephone system, R. M. Eaton 843,078 Telephone system, R. M. Eaton 843,078 Telephone system, R. M. Eaton 843,329 Telephone system, R. M. Eaton 843,329 Telephone trunking system, H. G. Webster 843,322 Telephone trunking system, H. G. Webster 843,326 Telephone trunking system, H. G. Webster 843,326 Thimble forming machine, F. A. Christensen, et al. 843,000 Thread guard, S. B. Wilsen 843,190 Three See Fencing tie. 843,190 Time recorder, J. G. Wynn 842,990
the February 23, ontain all that is me of the fastest nerican and Formal beauth of the illustrated ibed. Plans and is of comfortable in depleasure boats dinary user will blished. A promoure will be an illing what has implished the past the new type of the past the new type of the past in motor boat numbers will be many which will appeal adoubtedly reach thes, yachts and	Steel, iren, and ether metals, toughening or annealing, W. F. L. Frith

Classified Advertisements

Advertising in this column is 50 cents a line. No less than four nor more than ten lines accepted. Count seven words to the line. All orders must be accompanied by a remittance. Further information sent on request.

SALE AND EXCHANGE.

FOR SALE.—Road Leveler, Grader and Drag combined. Patented Nov. 20, 1906. Easily changed, cheaply made Will sell or on royalty. Chas. W. Kauffman, Route No. 5, Box 74, Bloomington, Ill.

WONDERFUL HOT AIR ENGINES for small power Practical. Easy running. No danger. No trouble. Cost only a few cents per day while working. \$7.50 to \$10. We also have 1-16, ½ and ½ horse-power. Harbach & Co., 809 Filbert Street, Philadelphia, Pa.

WANTED.—EVERYBODY INTERESTED IN GAS Engines to know of my patent device for perfect lubri-cation of piston, easily attached to oilcup. No sticking of rings. Saves oil. Saves repair. Sent on trial. 75c. each; \$2.00 for 3. For full particulars and information, address The Anderson Co., Warren, Pa.

BUSINESS OPPORTUNITIES.

PATENTS SOLD ON COMMISSION.—If you wish to buy or sell a patent write for particulars to E. L. Perkins, 72 Broad Street, Boston. Patent Sales Exclusively.

WANTED.—PARTIES TO MANUFACTURE Churn on royalty. Made principally of wood. For further particulars and full information, address John C. McVey, 30.3 Indiana Avenue, Kansas City, Mo,

CHEAP ICE.—Make your ownice. From 1 pound to 1,000 pounds of ice produced daily by the Howell system. Address Howell Ice Making Company, 7 Coenties Shp, New York City.

SEND SKETCH for estimate if you have anything you want made on contract. Experimental work. Inventions developed. Metal patterns a specialty. Osborne Manufacturing Co., Erie, Pa.

WANTED.—Business Opportunities and Real Estate for Cash Buyers. If you want to sell your Real Estate or Business, no matter where located, send description and price to Frank F. Oleveland, Real Estate Expert, 1510 Adams Express Building, Chicago, Ills.

WE ARE IN POSITION to secure capital, special or active partners for good, sound business propositions; we have several clients on hand who will consider busi-ness openings that will stand thorough investigation. Sam'l T. Bondhus & Co., 97-39 Nassau St.

WANTED-THE MANUFACTURE OF SMALL Parts. We are experts in supplying small parts for the most delicate instruments. You should get our estimate before having work done. The Golden Lathe Rep. & Mfg. Co., R. 33 Jewelers' Building, Boston, Mass.

AGENTS WANTED to sell best kettles in world for cooking, steaming, straining food of all kinds. No more burned or scalded hands, no more food wasted. Sample free. For particulars write American Specialty Stamping Co., Johnstown, Pa.

PARTY WANTED with capital to investigate and work Goldboring and Silverboring Ledges of various formations; assays per ton, \$472 to \$1323; close to railroad and can be worked easily. Address, Box 60, Fitzwilliam Depot, N. H.

METAL NOVELTY WORKS CO., Manufacturers of all kinds of light Metal woods, Patented Articles and Hardware Specialties on contract. Metal Stamping Dies and Stamping our specialty. 43-47 Canal St., Chicago.

PATTERN LETTERS AND FIGURES (White Metal and Brass) for use on patterns for castings. Large variety, prompt shipments. Send for catalog. H. W Knight & Sen, Seneca Falls, N. Y,

WANTED. - Some one to finance a new airship, Beats them all. \$3,000 to \$5,000 for an interest. Worth millions. For particulars address P. O. Box 537, Port Arthur, Texas.

FINANCING AN ENTERPRISE—Practical 500-page book, by Francis Cooper. telling how money is secured for enterprises. The only successful work on promotion. Endorsed by business men all over the country. Two volumes, buckram binding, prepaid, \$4.00. Pamphlet and list of business books free. Ronald Press, Rooms 30-32, 229 Broadway, New York.

EXPERT STEEPLE CLIMBER, 17 years experience, will teach business complete. Models, illustrated lectures, practice. Or by mail. Experience unnecessary. Very profitable. John F. Meighan, 311 W. 114th St., N. Y.

Very profitable. John F. Meg an, 31 W. 114th St., N. Y.,
FOR S ALE.—Portable Compressed Air House Cleaning Wagons and Machinery sold to responsible parties
to operate in cities of from five thousand inhabitants
upwards. Each Portable Cleaning Plant has an earning
capacity of from \$50.00 to \$70.00 per day, at a cost of
about \$80.00 per day. Capital required from \$200.00 upwards. Stationary Residential Plants also from \$450.00
upwards. Over 100 companies operating our system. We
are the pioneers in the busin ess, and will prusecute all
infringers. State references. Address General Compressed Air House Cleaning Co., 4453 Olive Street, St.
Louis, Mo.

I SELL PATENTS.—To buy or having one to sell, write Chas. A. Scott, 719 Mutual Life Building, Buffalo, N. Y.

HELP WANTED.

MACHINE SHOP superintendents and foundry foremen—especially brass—are greatly in demand. If you have ability and experience write usto-day. Hapgoods, 305 Broadway. N. Y.

MEN 830-8100 WEEKLY.—Learn Hairdressing, Mani-curing, Chiropody, Massage, Beautifying, which pays ten times better than any other calling. Personal and Mail Courses. Pref. Robrer's Institute, 147W.23dSt.,N.Y.

TYPEWRITERS.

WELLINGTON Typewriter! Durable, strong, speedy. All reliable features of standard machine. Permanent alignment and simplicity eliminating repairs. Workal-ways in sight. \$60. Williams Mfg. Co., 35 B'dway, N.Y.

TYPEWRITERS.—Caligraph, \$5. Hammond, \$10. Remington, \$12. Remington two-color ribbon attachment, \$18. Send for catalogue. Typewriter Co., Dept. L, 43 W. 125th Street, New York City.

SPECIAL BARGAINS.—Remington No. 2, writing two colors; Densmore, Hammond, Frankin \$15 each, shipped privilege of examination. Write for complete catalogue "F," Eagle Typewriter Co., Suite 11, 237 Broadway, N.Y.

PATENTS FOR SALE.

OFFERS are invited for purchase of four United States Patents covering Incandescent Gasoline Lamps. The Lamp is agreat success in Brtain as manufactured by Petrolite, Ltd., 106 York Road, Lambeth, London. The Lamp is safe (liquid being contained in absorbent block), clean and conomical, with brilliant light. No smoke, no smell, no cleaning. Inquiries to Guthrie & Cairus, 4a St. Andrew Square, Edinburgh, Scotland.

FOR SALE -Tangent Motor, Patent 119,586, a simple, light, power, speed engine. Force is steam, gas, air, etc., on tangent line. Full impact multi-expansive, constant. Ira J. Paddock, Percival, Iowa.

NEW IDEA IN HOOKS FOR DRESSES.-Positive. It works! Does not pull or tear fabric. Dressmakers delight. Patent for sale, but trade name must be mine. Anna Feageans, 3714 Ellis Ave., Chicago, Ill.

FOR SALE-Patent for Door Latch and Lock. Entirely new principle of construction and operation. Will revolutionize lock business. See description, this paper January 5. Peter Ebbeson. St. Paul, Neb.

STAMPS AND COINS.

1,000 FINEST OUALITY STAMP HINGES and price-list free. 1,000 u different stamps mounted and arrang-ed by countries, 83, 100 different U.S. stamps, 1851-1900 for 20c. Metropelitan Stamp Co., 81 Nassau St., 1851-1900

FACTORY AND MILL SUPPLIES.

STOP PAYING WATER RENT at your mill or factory. Erect a Caldwell Tank on a Caldwell Tower or your building. Plenty of pressure for e ery purpose fire protection besides. First cost only cost. Dozens of references right around you. John T. Steams & Co., Silk Manufacturers, of Elmira, N. Y., say: "Don't see how a factory could so without it." Send for Illustrated Catalogue and Price List. W. E. Caldwell Co., Station D. D., Loutsville, Ky.

SITUATIONS WANTED.

DRAUGHTSMAN - MECHANICAL, GRADUATED from the Technical School of Stockholm, Sweden, seeks position. With practice in the electrical and automobile branch. Not up in language, but good worker. Address B, care of Dr. Borgstrom. 155 E. 40th St., N. Y.

WANTED-MISCELL ANEOUS.

Wanted, Platinum Scraps we pay \$1.50 per dwt. for clean PLATTNUM SCRAPS.
Send by Registered Mail for Safety.
National Refinery, 239 Taylor Ave., Newport, Ky.

MACHINERY FOR SALE.

REMOVED to larger quarters, we offer our large stock of new and second-hand machinery; also boilers, engines, dynamos, motors, materials and supplies. Liberty Machinery Mart, 153 West Street, New York.

BOOKS AND MAGAZINES.

DEEP BREATHING-How, When and Where. A 64-page illustrated book on this vital subject on receipt of id cents. Address P. von Boeckmann, R. S. 750, Bristol Building. 500 Fifth Avenue, New York.

THE POCKET LAWYER.—A bandy, practical reference book containing all needed information on legal subjects, Banking. Labor Legislation, Etc. Price 10 cts. Postage prepaid. Landsberg Bros., 96 Fulton St., N. Y.

SOUVENIR POST CARDS.

LIFE-MOTION POST CARDS.—New York's latest fact. Application of a light produces moving picture effect. An evening's fun can be provided with a set of these cards. Special Offer—Set of 9 assorted subjects, postpaid, 5%c. Eagle Card Co., 2 Park Place, N. Y.

1,000 POST CARDS \$6: 500-\$4; made to order from any Photo or Print with your imprint on each as publisher. Workmanship guaranteed. Goods delivered within 10 days. Rich Photo Process Co., Dept. F, 28 E. 23d St., N.Y.

OFFICE SUPPLIES.

WHY DON'T YOU BUY a time-saving, brain-resting Locke Adder? Rapid. Accurate. Simple. Durable. Capacity, 999,999,999. Price only \$5. Booklet free. C. E. Locke Manufacturing Co., 25 C Street, Kensett, Iowa, U. S. &

PHOTOGRAPHY.

ALL THAT'S GOOD IN PHOTOGRAPHS-For publication or private orders. Developing, printing private orders. Spooner & Wells, Inc., 1851 Broadway, cor. 65th St., New York. Tel. 3472 Col.

WE PHOTOGRAPH any thing, any where, any time, Building, Paintings, Plans, Models, Machinery, Pistates, etc. Illustrations for Advertisers. The General Photographing Co., 1215 B'way, Daly's Theatre Bidg., N.Y. City

AUTOS.

UNDERSTAND YOUR AUTOMOBILE! The Motor Car Model tells all about construction, mechanism and location of every part. Strongly bound in Cardboard, 9½ x 13½, Colored Plates, Condensed Text, giving comprehensive idea of workings. \$1.57 sostpaid. Whittaker, 12 Bible House, New York.

EDUCATIONAL.

MONEY IN DRAWING.—AMBITIOUS MEN AND Women send for my booslet "A New Doorto Success," Full year's practical art instruction for \$20. Grant E. Hamilton Studio, 141 Flattron Building, N. Y.

ASTRONOMY.

STARS AND PLANETS—learn to know them at a glande! Astronomy in simplest and most fascmating form. The Revolving Planisphere shows clearly principal stars visible any hour in year. Simple, handy, reliable. Only 83c. (f. Whittaker, Publisher, 123 Rible House, New York.

SCHOOLS AND COLLEGES.

GFO. H. WILSON, the World's Champion, has written a booklet, "Vandeville, Stage Dameng and Entertain-ing." It is absolutely free and very interesting. Jus-uaddress Wilson's Vaudeville School. 263 W. 42d St., N.Y.

PATENT Laws and Office Practice.—Thoroughly practical course by mail for attorneys and inventors. Free specimen pages and information. Cor. School of Patent law, Dept. A, 1853 Mintwood Place, Washington, D. C.

ALCOHOL MANUFACTURING.

EXPERT ADVICE in the manufacturing of alcohol and compressed yeast. Analysis of all raw materials and by-products. H. H. Freund, Technical Fermentation Chemist, 145 East 23d St., New York.

٠.			nitures Industrielles l'Oleo	60 336	
	Type distributing machines, type channel		Engines, explosive, Robertson Manufactur-	00,000	-
	Type distributing machines, type channel for, D. B. Ray	843.173	ing Co	60.335	
	Typewriter attachment, W. C. Plank	843,360	Ergot preparation, H. S. Wellcome	60,447	
	Typewriters, manifolding means for flat		Eye water, Haislip & Haislip		
r. í	platen, H. J. Halle	843,012	Feed grinders, L. B. McCargar		
t i	Typewriting machine, J. D. Powell		Feed, poultry, Albert Dickinson Co	60,249	
ļ-	Typewriting machine, D. A. Carpenter	843,071	Files. Butler Brothers	60.353	
٠	Typewriting machine, A. W. Hewitt		Flour, wheat, Klingman Milling Co	60,258	
ıl	Typewriting machine, J. A. Wherry.843,247,		Flour, wheat, Valier & Spies Milling Co.,		
-	Typewriting machine, C. P. Mosher		60,267,	60,268	
t.	Typewriting machine platen, J. Ziegler	843,057	Flour, wheat, Crete Mills	60,271	
	Typewriting machines, combination book		Food, cattle, Atlantic Export Co	60,269	
ا ـ	and billing platen for, C. F. Laganke.	843,022	Fruits, dried and evaporated, W. D. Jame-		_
ď:	Umbrella, M. G. McGuire		son	60,291	
u '	Ombreila, W. E. Moulton		Gas burners, illuminating, Alton Mfg. Co	6♥ ,288	3
·	Valve, ball cock, C. C. Tozier	842,922	Gin, Mallard Distilling Co.	ov,380 :	3,
ı	Valve, grain door, H. C. Ostermann	042,969	Globes, educational, J. L. Hammett Co	60,359	Ŋ
	Valve mechanism, J. T. Wadsworth		Gloves, kid, Dayton Dry Goods Co	00,420	. <u>I</u> II.
	Valve seats, tool for preparing, S. M. Hall Varnishes, balsams, and resins, manufac-		Ham and breakfast bacon, Charles Wolff	en 959	U)
a	ture of, A. Kronstein	849 401	Packing Co	00,203	0
	Vault, burial, W. K. Waters		60,355,	60 356	(1
äΙ	Vehicle front gear, C. G. Streich	843 117	Hose clamps, W. D. Allen Mig. Co		71
. :	Vahiela running gaar W H Stricklar	843 420	Inhaling devices, J. L. Perkins	60.346	'n
it	Vehicle running gear, W. H. Strickler Vehicle stake, G. L. Harvey	843,206	Inking nada J B Laughton	60 431	11
0	Vehicle storm front, L. Cockerill	843,133	Insecticide for bugs and blight, B. Ham-	55,101	34
&	Vehicle top shifter fastener, J. Z. Miller	843,348	mond	60.413	37
	Vehicle wheel, W. Quivey		Insecticide for bugs and blight, B. Hammond Insects, preparation for killing, C. Lust-	,,	у,
, !	Veil pin. J. T. Dean	843.263	garten	60,379 i	Ţ,
., i	Vending machine, R. R. Ball	843,127	Insulated electric wire and cable, Safety In-		Į)
ı-	Ventilator hood, W. R. McKeen, Jr	843,413	sulated Wire & Cable Co60,369,	60,370	()
	Vessels, water ballast controlling appara-		Jacks, ratchet, screw, and track, A. O.	!	()
	tus for, C. B. Calder	842,856	Norton Incorporated60,420,	60,421	L.
S i	Vise, T. Osterberg	843,295	Knitted goods, certain, American Hosiery		١١٩
ا يَ	Voting machines, entrance and exit actuat-		Co60,352, 60,372,	60,401	1.4
	ing mechanism for, Barnum & Shep-		Knives, forks, spoons, table steels, nut	20.000	11
	ardson	843,431	picks, etc., Landers, Frary & Clark	60,330	ы
!-	Wagon, dumping, H. F. Langreder 8	843,284	Lamps and lanterns and burners therefor,	00.000	IJ
s	Wagon remover, A. J. Hawkes	843,146	oil burning, R. E. Dietz Co	60,282	Ţ)
اد	wardrope nanger, v. E. Clark	842,940	Lard, Schwarzschild & Sulzberger Co	60,284	-
					_
					_

		_
er stid	Washboard, F. Martin 842,964 Washboard, W. B. Lichtig 843,469 Washing boiler, A. L. Brazee 843,469 Washing machine, J. A. McClore 843,340 Watch, W. J. Walker 843,480 Watch fob. C. Wallerstedt 843,049, 843,050 Water elevating machine, S. A. Huntley 843,252 Waeding and cultivating device, T. J. King 843,399 Welding the longitudinal joints in tubular objects, electrically, E. Bier 843,515 Wheel, W. H. Clark 843,008 Wheel, W. H. Clark 843,098 Whiffletree, R. R. Burton 843,131 Whip holder or hanger, G. Keller 842,960 Window glasses and for preventing them from freezing, device for cleaning 42,960 Window screen, adjustable roller, A. J. Baker 843,061 Wire fabric, loom for making, G. Giussani. 843,229 Wire fabric, loom for making, G. Giussani. 843,229 Wire reel, O. H. Juve 843,213 Wire reel guide, O. H. Juve 843,213 Wire stretcher, Z. A. Curtis 842,866 Wire stretcher, C. E. Logan 843,343 <td< td=""><td></td></td<>	
9	Wrench, H. W. Hughes 843,274 X-ray tube, M. Ehrhardt 842,875	i
	DESIGNS.	
	Dish, cover, R. L. Johnson	
	Glass dish, B. W. Jacobs	1
	TRADE MARKS.	

Cleaning, polishing, or scouring preparation in powdered form, Lever Brothers Co. 60,261 Clocks and dials therefor, watchmen's Newman Clock Co. 60,261 Clothing, certain named, Denison Dodd Bowers Co. 60,322 Cotting, certain named, Denison Dodd Bowers Co. 60,262 Coccanut, shredded, Franklin Baker Co. 60,276 Coccanut, shredded, Franklin Baker Co. 60,276 Cords, twines, and ropes, Silver Lake Co. 60,317 Corset covers and waists, C. A. Powell. 60,334 Corsets, Dayton Dry Goods Co. 60,323 Cotton piece goods, R. A. Suffern. 60,337 Cotton piece goods, C. C. Copeland & Co. 60,408 Cotton piece goods, unbleached, Ashton, Hoare & Coy Cranks, crank axles, pitmen, piston reas, and shafts, Fried. Krupp Aktiengesellschaft. 60,430 Cutlery, certain named, Butler Brothers. 60,341 Decoys, H. W. Mason 60,310, 60,311 Decoys, H. W. Mason 60,310, 60,311 Dough mixing machines, Joseph Baker & Sons American Oven Co. 60,324 Ejectors, inspirators, and tank wells, United Injector Co. 60,324 Ejectors, inspirators, and tank wells, United Injector Co. 60,326 Engines, explosive, Robertson Manufacturity sparking and igniting apparatus, Societe Generale des Huiles et Fournitures Industrielles I Oleo 60,336 Engines, explosive, Robertson Manufacturing Co. 60,326 Ergot preparation, H. S. Wellcome 60,337 Flour, wheat, Klingman Milling Co. 60,258 Flour, wheat, Klingman Milling Co. 60,269 Fruits, dried and evaporated, W. D. Jameson Go. 321 Gas burners, illuminating, Alton Mfg. Co. 60,289 Gin, Mallard Distilling Co. 60,388

"Skipper"^{*} 24⁹⁰ 2 HORSE POWER The only 2-cycle marine engine on earth that runs equally well on Kerosene, Dis-tillate Oil, Alcohol or Gasoline.

Positively will not back fire. Guaranteed for five years. The engine with the simplest and most wonderful fuel device known. Easy to start, reverse and regulate speed. The WORLD FAMOUS "SKIPPER" is a sturdy, speedy, simple engine easily and quickly installed in launch, row boat or canoe. The engine that doesn't break down.

"AS SURE AS AN OAR"

Made in five sizes. 2 actual H. P., bare engine, -Complete with engine, electric and boat fittings, -

Send to-day for free Catalogue.

ST. CLAIR MOTOR CO. Dept. C, DETROIT, MICH.

─You Can Whitewash Cheaper and Better One man can apply whitewash or cold water paint to 10,000 Square Feet of Surface in One Day with a Frogress Spraying and Whitewashing Machine and do better work than with a brush. It is also adapted for spreading disinfectants, destroying insect pests and diseases on trees, vegetables and other plants, extinguishing fires, washing windows, wa gons, etc., and other purposes. The machine is really a little water works system on wheels because the easy movement of the pump develops a really a little water works system on wheels because the easy movement of the pump develops a really a little water works system on wheels because the say movement of the pump develops a for the pump develops and will raise the liquid more than 50 feet above its own level. The Progress, 12 gallon size, costs only \$2,000; the 20 gallon size, 2000. It will last a lifetime and pays for itself the first year. When types of machines sold as low as \$3,000 and \$1,000. Write for detailed description.

Our Hand Book on Patents, Trade-Marks, etc., sent free Patents procured through Munn & Co. receive free notice in the SCIENTIFIC AMERICAN MUNN & CO., 361 Broadway, N. Y. Branch Office: 625 F St., Washington, D.C.

PHOTO BARCAINS

Cameras, Microscopes and Stereopticons

at reductions of 40 to 75 per cent. at reductions of 40 to 75 per cent.

Having purchased from Messrs. Clegg & Co. their great stock of standard apparatus, we are closing out this entire line at most unusual figures.

Send for Photo Bargain List No. 24. Microscope Bargain List No. 12 E. Stereopticon Bargain List No. 10 U.

WILLIAMS. BROWN & EARLE

Dept 6 918 Chestnut Street, Philadelphia, Pa,



vear from 1 1-2 to 90 H. P. If you want agency, write at once.

DETROIT GAS ENGINE AND MACHINERY CO.

58 East Congress St., E., Detroit, Mich.

DRILLING Machines

Over 70 sizes and styles, for drilling either deep or shallow wells in any kind of soil or rock. Mounted on wheels or on sills. With engines or norse powers. Strong, simple and durable. Any mechanic can operate them easily. Send for catalog.

WILLIAMS BRCS., Ithaca, N. Y.

To Book Buyers

We have just issued a new 112-page catalogue of recently published Scientific and Mechanical Books, which we will mail free to any address on application.

MUNN & COMPANY Publishers of Scientific American 361 Broadway, New York

DON'T BUY GASOLINE ENGINES "THE MASTER WORK WAN," a koohol engine, superior to any one-cylinder engine; revolutionizing power. Its weight and bulk are half that of single cylinder engines, with greater durability. Costs Lesg to Buy—Less to Run. Quickly, easily started. Vibration practically evercome. Cheaply mounted on any wagon. It is a combination protable, statumary or traction engine. Sand for Cavalogue. THE TEMPLE PUMP CO., Mifra., Mongher and 15th Sts., Chicago. THIS IS COR FIFTY-THIRD YEAR.





ST. LOUIS WRECKING AND SUPPLY CO. 3865 Manchester Ave., St. Louis, Mo.

High Grade Brass Manufacturers

BRASS CASTINGS of any composition and for any class of service Made to Order. Estimates furnished on brass, bronze, copper or aluminum specialty castings for all requirements. Correspondence solicited with manufacturers seeking high class brass foundry facilities.

THE HUMPHREYS MANUFACTURING CO.
Mansfield. Obio

New York Office 6.6-638 W.34th Street

Pony Rigs for **Boys and Girls**





Copyrights &c.
Anyone sending a sketch and description may quickly ascertain our opinion free whether an invention is probably patentable. Communications strictly confidential. HANDBOOK on Patents sent free. Oldest agency for securing patents. Fatents taken through Munn & Co. receive special notice, without charge, in the

A handsomely illustrated weekly. Largest cir-culation of any scientific journal. Terms, \$3 a year; four 120nths, \$1. Sold byall newsdealers. MUNN & Co. 361 Broadway, New York Branch Office. 625 F St., Washington, D. C.

Let Us Arrange a Month's Test of Programment and Control of Contro Watches, Mermod, Jaccard & King Jewelry
Co. 60,433
Water, spring Anita Spring Water Co. 60,373
Whisky, P. T. O'Brien 60,381
Whisky, Ferncliff Distillery Co. 60,412
Whisky, Ferncliff Distillery Co. 60,412
Whisky, Wm. Bergenthal Co. 60,418
Whisky, To-Kalon Vineyard Co. 60,383
Wrenches, John A. Roebling's Sons Co. 60,327
Yam produced from wood pulp, cellulese,
or viscose, G. Lund 60,309
Yeast, compressed, Fleischmann Co. 60,274
Yeast powder and baking powder, Rumford
Chemical Works 60,394
Zinc, white, J. Lucas & Co. 60,277, 60,278

LABELS.

"Arbiter Hand Plated Extra Superfine," for writing papers, White & Wyckoff Manufacturing Co.

Arbiter Hand Plated Linen Fabric, for writing papers, White & Wyckoff Manufacturing Co.

Arbiter Hand Plated Linen Fabric, for writing papers, White & Wyckoff Manufacturing Co.

"Arbiter Hand Plated Linen Fabric, for writing papers, White & Wyckoff Manufacturing Co.

"Mint-Seltzer," for granular effervescent salts, Buffalo Pharmacal Co.

"Sawyer's Crystal Sheet Bluing for the Laundry," for washing blue, Sawyer (Crystal Blue Co.

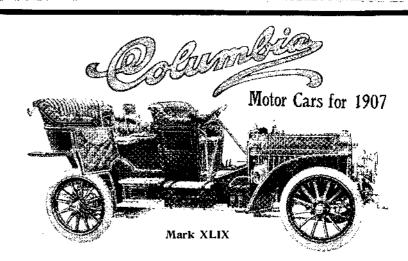
"The Bute Oil Shoe Dressing," for leather dressing, Wolff Chemical Co.

"Vanilla Substitute," for vanilla substitute,
"Vanilla Substitute," for vanilla substitute,
"Vale" for underwear. Halmes Knitting Co. 13.347 ROTARY PLMPS AND ENGINEES.

PRINTS.

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date begiven. Address Munn & Co., 361 Breadway, New York.

Canadian patents may now be obtained by the inventers for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.



RE constructed throughout in a manner that for uniformity of excellence is unequaled in any other motor cars, and they also contain certain exclusive features which alone so add to their worth as to make them preferable to all others.

One point of exclusiveness is found in the quality of steel used for the sawed-out crankshaft, sliding gear transmission, bearings, axles and other vital parts.

Another exclusive feature is the multiple jet carburetor which affords the proper mixture of gas to run the car to the greatest advantage at whatever speed you wish to go. This carburetor combines two carburetors in one, the two devices working together so as to require no more adjustment, attention or care, than a single carburetor of any of the older patterns.

Further exclusiveness is seen in the elegance of the design, finish and appointments of our touring car and limousine bodies.

Mark XLIX, 40:45 H. P. Touring Car, \$4500 Limousine, \$5500 Mark XLUIII, 24-28 H. P. Touring Car, \$3000 Limousine \$4200

Our catalogue of Columbia Gasoline Cars for 1907 is, both in print and in illustration, the most artistic book of its kind ever issued. With each copy is presented a large "X-ray" or shadowgraph reproduction of our Mark XI/VIII Touting Car, which is the most remarkable picture of an automobile ever produced. Mailed free upon request; also separate catalogue of Columbia Electric Carriages.

ELECTRIC VEHICLE CO., HARTFORD, CONN.

New York Branch: Electric Vehicle Company, 134-136-138 West 39th St. Chicago Branch: Electric Vehicle Company, 1332-1334 Michigan Ave. Boston: The Columbia Motor Vehicle Company, Trinity Place and Stanhope St. Washington: Washington E. V. Trans. Co., 15th St. and Ohio Ave. San Francisco: The Middleton Motor Car Company, 550 Golden Gate Ave. Member A. I., A. M.



WRITE FOR ESTIMATE ON ANY ARTICLE
YOU WANT MANUFACTURED
STAMPINGS, MODELS, EXPER. WORK
WRITE FOR FREE BOOKLET
THE CLOBE MACHINE & STAMPING CO.
870 Hamilton St., Cieveland, O.

Corliss Engines, Brewers and Bottlers' Machinery. THE VILTER MFG. Co. 899 Clinton St. Milwaukee. Wis.

MODELS & EXPERIMENTAL WORK Inventions developed. Special Machinery E. V. BAILLARD, 24 Frankfort Street. New York,

Expert Manufacturer Fine Jobbing Work RUBBER PARKER, STEARNS & CO., 228-229 South Street, New York

HARVARD UNIVERSITY

ROTARY PUMPS AND ENGINES Their Origin and Development.—An important series of papers giving a bistorical resume of the rotary pump and engine from 1588 and dilustrated with clear drawings showing the construction of various forms of pumps and engines. 33 flustrations. Contained in SUPPLEMENTS 11099, 1110, 1111. Price 10 cents each. For sale by Munn & Co. and all newsdealers.





A WATCHMAKER Send for our free book, How to be a Watchmaker. Stone School of Watchmaking, 94 Globe Bldg., St. Paul, Minn.



Frictionless Metal

Telegraphy

Circular free. Wooderful
automatic teacher. 5 eye

Wood Bup. MNIGRAPH
Of. Pept. 59, 89 Curtlandt St., New York. Circular free. Wonderful

MODELS O INVENTIONS PERFECTED WORKS GEARS OF 198 SOCIARKS, CHICAGO.

Model and Experimental Work. Years of ex-rience. M. P. Scholl, 1759 Union St., San Francisco

Print Your Circulars, books, newspaper, Press \$5. Large size \$18. Money saver, maker. All easy, printed rules. Write factory for catalog, presses. type paper, cards. THE PRESS CO., Meriden, Conn.

SPARK COILS

Their Construction Simply Explained

Scientific American Supplement
160 describes the making of a 1½-inch spark
coil and condenser.
Scientific American Supplement
1514 tells you how to make a coil for gasengine ignition.
Scientific American Supplement
1522 explains fully the construction of a
jump.spara coil and condenser for gas-engine
ignition.
Scientific American Supplement

Scientific American Supplement 1124 describes the construction of a 6-inch

spark coil
Scientific American Supplement
1087 gives a full account of the making of
an alternating current coil giving a 5-inch

spark.
Scientific American Supplement
1527 describes a 4-inch spark coil and con-

denser.
Scientific American Supplement
1402 gives data for the construction of coils
of a definite length of spark. The above-mentioned set of seven papers will be supplied for 70 cents.

Any single copy will be mailed for 10 cts. MUNN @ COMPANY, Publishers 361 Broadway New York





e freight. Samples upon request. Write today. Addi ASBESTOS MFG. & ROOFING CO. Manufacturers of Everything in the Asbestos Line 216 CARR STREET ST. LOUIS, MO.

TO BE LEARN

A WATCHMAKER Bradley Polytechnic Institute

We teach Watch Work, Jewelry, byraving, Clock Work, Optics, intion reasonable. Board and cours part school at moderate rates, and for Catalog of Information.



Also 1000 useful articles, including Safes, Sowing Machines, Bicycles, Tools, etc. Save Money. Lists Free CHICAGO SCALE CO., Chicago, Ill.

Bausch & Lomb

Chemical Apparatus

For every kind of laboratory or experimental work we can supply the requisite apparatus. Our glassware is the finest imported make — beakers, flasks, graduated burettes, pipettes and other forms of measures, both English and metric standards. Complete stocks. Send for catalogs.

Bausch & Lomb Optical Co.
Rochester. N. Y.

NEW YORK BOSTON WASHINGTON
CHICAGO SAN FRANCISCO

"LIBERTY BRAND" Steel Letters and Figures

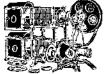


Are the best made. Warranted band-cut on best tool steel. Put up in polished bardwood boxes. Are sold by leading hardware dealers.

ALLEN, DOANE & CO., Boston, Mass., U. S. A.

Fine steel letter-cutting of all kinds; special prices to toolsmiths. Warranted name stamps for marking tools mailed anywhere 17c, per etter



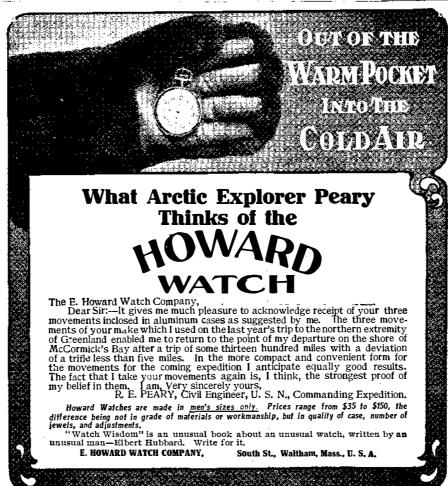


"Business Guide tells all, We furnish Complete Outfits with Big Advertising Posters, etc. Humorous dramas brimful offun, travel, history, religion, temperance work and sons illustrated. One man can do it. Actonishing

ance work and songs illustrated.
One man can do it. Actonishing
Opportunity in any locality for
a man with a little money to show
in churches, school houses, lodge
halls, theatres, etc.
Big profits each entertainment. Others
do it, why not you? It's easy; write to us and we'll tell you
now. Cataloguefree.

now. Cataloguefree.
AMUSE MENT SUPPLY CO. 467 Chemical Bank Ridd., CHICAGO





NEW AMERICAN BOCK ON ITS MANUFACTURE—NEW LAW AND REGULATIONS Tells in a plain practical way what YOU want to know on this subject BOOK MAILED FREE ON RECEIPT OF \$1.00

SPON & CHAMBERLAIN, 123 S. A., Liberty Street, NEW YORK

STEAM USERS

The original and only genuine red sheet packing.

The only effective and most economical flange packing in ex-

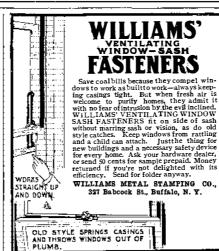
Can't blow Rainbow out.

For steam, air, hot or cold water, acid and ammonia joints.

Beware of imitations.

Look for the trade mark—the word Rainbow in a diamond in black, three rows of which extend the full length of each roll.

Manufactured exclusively by PEERLESS RUBBER MFG. CO. 16 Warren St., New York





Will Make You **Prosperous**

If you are honest and ambitious write me today. No matter where you live or what your occupation, I will teach you the Real Estate business by mail; appoint you Special Representative of my Company in your town; start you in a profitable business of your own; and help you make bug money at one. Unusual opportunity for men without capital to become independent for life. Yaluable book and the second independent for life. Write to-day, Address nearest office.

EDWIN R. MARDEN, President National Co-operative Realty Co. 656 Athenæum Bullding, Chleago Maryland Bullding, Washington, D. C.

WRITE FOR FREE BOOKLET SHOWING MOISTURE

STRONG & DURABLE

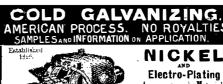
The New York Standard CHRONOGRAPH

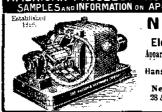
IS THE ONLY "Stop-Watch" Watch

made in America and is unequaled for Laboratorial and Experimental Work, Photographic Purposes, Electric and Telephone Uses. Refiner and Compounders of Oils, etc. For Physicians, Surgeons, Nurses, and for the exact timing of all athletic events.

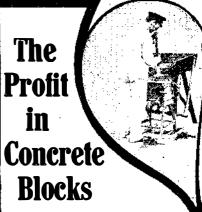
All Jewelers Sell Them

New York Standard Watch Co., 401 Communipaw Ave., Jersey City, N. J.





NICKEL **Electro-Plating** Apparacus and Material THE Hanson & Van Winkle Co... Newark. N. J. 28 & 30 S. Canal St. Chicago.



With a trifling investment for an Ideal Concrete Machine, any man, in any locality, can, without previous experience or other assistance, make wonderful profits in the manufacture of Ideal Concrete Building Blocks, from sand, gravel and a little cement.

IDEAL Concrete Machines

make Concrete Blocks that can be profitably sold cheaper than common brick. Equal the finest stone work in appearance and are far superior in durability and resistance to heat and cold.

Write for our free book! It is more than a catalogue, because it tells the wonderful story of the Concrete Industry; how men have reached success from a small beginning with the Ideal Concrete Machine, and how other men can profit by this experience and duplicate their success.



IDEAL **CONCRETE MACHINERY** COMPANY. Dept. E,

South Bend,

Ind.

"EXER-KETCH" IRON AUTO ran ausorate control rights for ward of back ward, constitute.

Ing or clim hing a hill.

ter. "CAN'T BE BROKEN and won't were out." No dead center. "Can't many hand car-motion), instantly interchangeable to the exact "Rowing and Semi-Rowing" exercise motions. Designed by a Physician to develop and strengthen the spine and clear, and rest the child's less. Write for our free offer. It tells you how to get an "Exer-Ketch" Iron Auto Free.

Exer-Keich" Novelty Co., 106 N. Senate Av., Indianapolis, Ind.





15 to 21 South Clinton Street.