


Wagner，on His 100－Horse－Power Darracq，Half Way Around the Hairpin Turn．This Car Won the Race，Covering the 297.1 Miles in 4 Hours， 50 Minutes， $10 \frac{2}{6}$ Segonds，at an Average Speed of 61.43 Miles an Hour．


Lancia，on His 120－Horse－Power Fiat，Skidding on the Final Bend of the Hairpin．The Italian Car Finished Second in 4 Hours， 53 Minutes，28 $\frac{1}{5}$ Seconds－an Average Speed of $\mathbf{6 0 . 8 4}$ Miles an Hour．

THE FRENCH AND ITALIAN CHAMPIONS DISPLAYING THEIR SKILL IN ROUNDING THE FAMOUS＂HAIRPIN＂TURN IN THE VANDERBILT CUP RACE．－－［See page 281．］

# SCIENTIFIC AMERICAN 

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will receive special attention. Accepted articles will be paid for will receive special at
at regular space rates.

## A $21 \frac{1}{2}$-KNOT BATTLESHIP.

A battleship which is capable of carrying a battery of ten 45 -caliber, 12 -inch guns across the high seas at a sustained sea speed of $211 / 2$ knots an hour and a maximum speed, for a limited distance, of $221 / 4$ knots, is a proposition which may well be commended to the serious consideration of that diminishing school of naval architects which believes that speed is a greatly overrated quantity in modern warship design. According to press dispatches, the British battleship "Dread nought," which has been undergoing her official trials, steamed for eight hours over a course 172 miles in length, at an average speed of $211 / 2$ knots, during which she reached a speed at times of $221 / 4$ knots. The turbine engines, which were designed for 23,000 horse-power, during the trial drove the ship at a maximum speed for which the corresponding horse power would be 28,000 . These results give to this remarkable ship the distinction of combining in herself, in the highest degree, the characteristics of the battle ship and the cruiser; for she has the offensive and defensive qualities of the one and the speed of the other.
In view of the high speed of the "Dreadnought," we think that our naval constructors should depart from the rather conservative policy which they have followed, and allot a larger share of the displacement of our future battleships to motive power. It is true that the "Dreadnought" and the three sister ships which are being constructed are, of all foreign warships, the least likely to be arrayed against our own; but we must remember that since the mark set by this vessel will be the standard of attainment for all foreign gov ernments, we must look for a speed of 20 knots and over in the typical battleships of the future.
Simultaneouisly with the announcement of the trials of the "Dreadnought," it was stated by a London daily, whose naval information is generally correct, that the designs of the three new British cruisers, "Invincible," "Inflexible," and "Indomitable," which were authorized last year, are based upon the "Dreadnought," and that like her they are to carry a main armament composed exclusively of 12 -inch, 45 -caliber guns, of which each vessel will carry eight. The three ships are to be of practically the same displacement as the battleship; and by placing the two broadside turrets en echelon, or diagonally, at the center of the ship, and the other two turrets on the center line, forward and aft, these cruisers will be able to deliver the same broadside and end-on fire as the "Dreadnought," namely, six 12 -inch guns ahead and astern, and eight 12 -inch on either broadside. Their conand eight 12 -inch on either broadside. Their con-
tract speed is to be 25 knots an hour; they will be tract speed is to be 25 knots an hour; they will be
driven by turbine engines; and their armor is to be something between that of the cruiser and the battleship. To all intents and purposes, then, these vessels will be battleships of the first class, carrying armor superior to that of many existing battleships, and having a speed from 6 to 8 knots greater than that of 90 per cent of the ships of this class afloat at the present time. In contemplating these $211 / 2$ and 25 -knot warships it is disconcerting to remember that we are spending $\$ 10,000,000$ on two battleships, the "Idaho" and "Mississippi," which are to steam only 17 knots an hour.

In the presence of such facts as these, it is not too much to say that a speed of 17 or even 18 knots is, for all future battleships, obsolete. Hereafter no design should be laid down which contemplates a speed of less than 20 knots an hour.

## COMPLETION OF THE PENNSYLVANIA DOUBLE

 TUNNELS.At just a quarter past four on the afternoon of October 9, the two shields in the south tunnel of the Pennsylvania Railroad met beneath the Hudson River, and the chief engineer, Mr. Charles M. Jacobs, had the satisfaction of formally declaring that the boring was completed. The driving of the
north tunnel was completed over a month earlier, the two shields on that occasion, as on this, meeting with great exactness.
Air pressure was first turned on at the Manhattan end of the north tunnel in June, 1905, and at the New Jersey end of the south tunnel, in the following month. During the intervening period, in which the air pressure has varied according to the depth of the tunnel from 20 to 37 pounds to the square inch, not a single life, according to the statement of the chief engineer, has been lost. During that time the enormous total of 66,000 tons of metal, consisting of the cast-iron lining, has been put in place, and the speed of driving has been such that all previous records on main line subaqueous tunnel work have been broken. Now that the tubes are in place, the important work f sinking the massive tubular piles through the bottom of the cylinders to the rock, which lies far below the silt and sand through which the tubes have been built, will be undertaken. These piles will be driven 15 feet apart along the axis of the tubes, and they are provided with a deep thread which, as the tubes are rotated, will carry them down to rock bottom. Where they pass through the cast-iron shell of the tube they will be rigidly connected to the same, and the weight of the tunnels and the trains that run through them will then be borne directly by the solid underlying rock and hardpan, assisted, of course, by the material through which the tubes have been driven. The strength and security of the tubes will be further insured by lining the interior with a coating of two feet of concrete. Each tube is 23 feet in diameter and over 6,000 feet in length from shaft to shaft. The present estimate of the time necessary to put the unnels in condition for the operation of trains is about one year and a half.

## PANAMA CANAL TO BE BUILT BY CONTRACT.

Next to the purchase of the Panama Canal, the most important step taken by the government affecting this great enterprise is its decision, recently announced, to have the construction of the canal done by contract. In no other way can it be built within a reasonable time. Proof of this has been abundant during the past few months, in which the great paucity of official information regarding the canal has raised a natural fear that matters were proceeding with halting steps, and that the government was encountering difficulties most serious and probably unoreseen. This silence has been in marked contrast to the stream of volubility which flowed from the Bureau of Publicity, or whatever it may have been called, which was instituted when the government first entered seriously upon the work of organization and construction. It is certain that perplexing problems have confronted the advocates of government construction. The Canal Commission appears to have been quite unable to solve the labor problem which, as the weeks have slipped by, has loomed large and perplexing, dwarfing, by comparison, the bugaboos of malaria, yellow jack, or even the turbulent Chagres River itself. For it has proved almost impossible to procure labor of the most simple and unskilled type, white or black, and this in spite of the fact that many experiments have been made with laborers from widely-separated localities, who were supposed to be peculiarly fitted to work under the conditions which prevail at Panama. Moreover, the many efforts made by the Commission to take to the Isthmus and retain there the more intelligent class of men capable of directing the common laborers and of performing other general duties of a more or less authoritative kind, have met with equal failure. It is more than probable that the discouraging results attending the efforts of the government to secure bids for the supply of Chinese labor, have proved to be the last weight in the scales to turn them in favor of doing the work by contract.
Many months ago, when this .journal was strongly urging the government to take the step which it has now decided upon, we were taken to task by a technical journal devoted to the engineering and contracting interests of the country, for proposing something which we were assured was, in the very nature of things, an impossibility. It was urged that there were only one or two firms which could command the capital necessary for the undertaking of such a huge task, and that, therefore, competition was out of the question, and the government would be, in the matter of price and time, at the mercy of the contractor. We are willing to admit that if bids were called for upon this work according to the methods commonly followed, there would be much truth in the criticism. But in the plan which the government is about to adopt, the interests both of the country and the contractor are so secured, that we feel satisfied the canal will be built under conditions which will guarantee the interests of both parties to the contract. For although he construction will be let by contract, the government of the United States will not, in the least degree, relinquish its authority over the work. In fact,
it will retain under its hand everything save the work of actual construction. The contractor will excavate and build, and the engineers of the government wil supervise. The government will make the contract with a single individual or concern, which will be composed of several reputable concerns, each of which will be expert in some particular branch of the work to be done at Panama. The companies presenting bids under the single contracting concern must have an aggregate capitalization, outside of debts and en cumbrances, of $\$ 5,000,000$, and the successful bidder must furnish a bond of $\$ 3,000,000$.

The bids will be awarded upon what is known as the percentage plan, each bidder setting forth for how small a percentage of profit on the total cost of the work he will undertake to do it. The contract will be awarded to the firm which offers to do the work for the smallest percentage, provided, of course, that the government is satisfied as to its ability to live up to the terms of its bid. The total cost upon which the compensation of the contractor will be based will be estimated by a board of engineers, two of whom will be appointed by the successful bidder, and three by the government. The chief engineer of the Commission will be one of the government's appointees and will act as chairman of the committee.
Before finally adopting the form of contract which is now announced, Chairman Shonts of the Canal Commission consulted with a large number of leading engineers and contractors, and the government is satisfied that several bids will be submitted to the Canal Commission for the work of construction. The com petition is not limited to American bidders; and should any foreign firms submit bids to the Commission, they will be considered upon the same basis as those handed in by American firms. In a letter transmitting to Secretary of War Taft the form of contract which the Commission has drawn up, Chairman Shonts states that if the elements of time and cost did not enter so vitally into the undertaking, the Commission would have created its own organization and done the work by day labor. This was rendered impossible by the "unprecedented and greatly-extended industrial activity of the times and the consequent violent competition for all classes of superintendents, foremen, sub-contractors, skilled mechanics, and even ordinary laborers." The great contractors of the United States have organized forces whijch stand pre pared and fully equipped to do such work as awaits them at Panama. The only new conditions which may threaten their efficiency are those due to the climate, with its attendant tropical fevers and general debilitating influences. The government claims, however, to have the problem of sanitation well in hand; and if General Gorgas and his staff of sanitary engineers are given a free hand there should be no cause for apprehension of such epidemics as have been wont to sweep through the Isthmus under the administration of earlier canal builders.
Conspicuous among the advantages of contract construction is the fact that thereby the work will be forever rid of the curse of political patronage. Furthermore, if the contractors are wise they will make it an indisputable condition in the bids that they shall be free to purchase supplies and plants in the cheapest markets, American or foreign.

## THE STATUS OF THE LIQUID BARRETTER

Of the many types of detectors devised for manifesting the presence of impinging electric waves on the aerial of a wireless telegraph receptor, none are more interesting in their various aspects than the liquid barretter of Fessenden.
Different from the coherer, the action of which was discovered by Branly, improved upon by Lodge, and perfected by Marconi, the liquid barretter, or, as it is perhaps better known, the electrolytic detector, is the result of the effort and ingenuity of one man, and to him alone is due the credit for evolving the idea, developing it experimentally, and finally applying it to the commercial reception of wireless telegraph messages.
The first detector Fessenden called a barretter-a euphonious name derived from "barretor," an old French word meaning "exchange," since it possesseत the property of exchanging the energy of the oscilla tions surging through it for a continuous current-was based on the fact that a loop of wire having an exceedingly small diameter requires an infinitesimal amount of current to heat it. To obtain this heating effect by means of electric oscillations set up in the antennæ the loop was made of a silver wire 0.002 inch in diame ter and having a platinum core 0.00006 inch in diame ter, the tip of which was immersed in nitric acid and the silver dissolved away, leaving a minute area of the platinum exposed. The ends of the loop were fastened to leading-in wires, which were sealed in a small glass bulb, the completed arrangement appearins very like a miniature incandescent lamp.
The action of this barretter is based upon the follow ing theoretical considerations, namely, that if a wire
having a specific heat factor of such value that the latent energy required to raise its temperature to a certain excess above the air is relatively compared with the energy lost by radiation during the time of a signal, then if such a wire is connected in a local battery circuit, when a given amount of current flows through it there will be a corresponding change in the magnitude of the current produced by the local battery. Thus it will be seen that such a detector is purely thermal in its action.
The hot-wire barretter formed an exceedingly sensitive detector, but it possessed the serious objection of burning out whenever the oscillations surging through it carried any excess of current. This difficulty led Fessenden to conduct a new series of researches, and in one instance a very small column of liquid was substituted for the platinum wire previously used. Many different modifications were tried, and among them may be cited a wire inserted in the liquid, so that the resistance might be concentrated in the neighborhood of the power.
This form finally became the liquid barretter, the subject of much litigation. It consisted of a Wollaston wire having a platinum core of two or three mils, the silver sheath being dissolved away in acid as before, and the exposed point of this was immersed in an acid or alkaline solution; the wire served as one of the terminals of the circuit, a small platinum vessel containing the electrolyte providing the other. This device was patented by Fessenden May 5, 1903.
Its inventor accounted for its action on the theory that the electric waves decrease the resistance of the barretter, since the temperature coefficients of liquids is generally negative, and as the resistance is decreased instead of increased, the efficiency of the detector is further improved.
The great value of the detector was quickly recog. nized by those versed in the art, and it was not long before there were a half dozen claimants in the field, who used it, insisting that to them belonged the perquisite of discovery and invention. Among these may be mentioned as the most aggressive Vreeland and De Forest in the United States, Schloemilch in Germany, and Ferrie in France.
In November, 1903, Schloemilch published an account of his alleged independent discovery of the liquid barretter principle in the Elecktrotechnische Zeitschrift, and in January, 1904, Vreeland in his book, "Maxwell's Theory and Wireless Telegraphy," puts forth his claim in the following words: "Another electrolytic detector was developed by the writer [Vreeland] in the course of a series of attempts to magnify the heating effects of Fessenden's barretter by immersing the wire in a liquid of high temperature coefficient and low specific heat, which was made a part of the local circuit. The attempt was unsuccessful, but it led to the discovery that a simple electrolytic cell, when polarized to the proper critical point by a current from a local battery, is remarkably sensitive."
De Forest outlined his claims to the liquid barretter in a paper read before the International Electrical Conss, St. Louis, 1904, in which he characterized the heat theory of Fessenden as untenable, stating that its operation was electrolytic. Upon this argument De Forest evidently wished to show an analogous action between his own electrolytic responder and the liquid barretter. Ferrie's claim was put forth by Blondel in the Electrical World in a letter published May 6, 1905.
With these various assertions of ownership, it is small wonder that litigation was inevitable, and as a matter of fact no less than six suits have been brought by the opposing interests, five of which were decided in favor of Fessenden, and one against him dismissed. In the first suit filed by the National Electric Signaling Company (Fessenden) against the De Forest Wireless Telegraph Company et al., in the United States Circuit Court, Judge Wheeler in rendering his decision said the testimony seemed to show that the De Forest detectors operated by bridges formed by the local circuit between closely parallel electrodes broken by the aerial impulse to give the signal, while the liquid barretter does not appear to operate by the making or breaking of any such bridges, but by a fluid path between the electrodes at variable distances.

As to Vreeland's claim, the court held that his work was merely an employee's step in the continuous investigations carried out by Fessenden. The court also disposed of the De Forest contention that the barretter operated electrolytically rather than thermally, holding that th theory of its action was of no importance in the case, and that the device sued infringed the claims of the patent regardless of what its mode of operation might be.

A decision was also rendered on January 27, 1905, in a suit of the National Signaling Company (Fessenden) versus the Gesellschaft für Drahtlose Telegraphie (Schloemilch) and a decree of injunction handed down restraining this company from using the liquid barretter in any of its forms. This disposes of all the active claimants except Ferrie, and after the above decisions it is not probable he will ever attempt to prove priority in this country.

SOMETHING ABOUT CEREAL BREAKFAST FOODS.
There is no part of the world except the Arctic regions where cereals are not extensively cultivated. From the oats and rye of the North to the rice of the hot countries, grains of some kind are staple foods.
An idea of the importance of cereal foods in the diet may be gathered from the following data, gathered by Dr. Charles D. Woods and Prof. Harry Snyder for the Department of Agriculture, based upon the results obtained in dietary studies with a large number of American families. Vegetable foods, including flour, bread, and other cereal products, furnished 55 per cent of the total food, 39 per cent of the protein, 8 per cent of the fat, and 95 per cent of the carbohydrates of the diet. The amounts which cereal foods alone supplied were 22 per cent of the total food, 31 per cent of the protein, 7 per cent of the fat, and 55 per cent of the total carbohydrates-that is, about three-quarters of the vegetable protein, one-half of the carbohydrates, and seven-eighths of the vegetable fat were supplied by the cereals. Oat, rice, and wheat breakfast foods together furnished about 2 per cent of the total food and protein, 1 per cent of the total fat, and 4 per cent of the carbohydrates of the ordinary mixed diet, as shown by the statistics cited. These percentage values are not high in themselves, but it must be remembered that they represent large quantities when we consider the food consumed by a family in a year.

The reasons for such an extensive use of cereal foods are not hard to find. Besides being cheaply and easily grown, the grains contain unusually good proportions of the necessary food ingredients with a very small proportion of refuse. They are also readily prepared for the table and are palatable and digestible. Owing to their dryness they are compact and easily preserved without deterioration.

The grain as it grows on the stalk is surrounded by a hull or husk, which is so indigestible that it is removed before the seed is used for food. Each grain has an outer skin or bran layer, which may or may not be removed in milling. It is nearly always taken off from rice and buckwheat, sometimes from wheat, corn, and rye, and almost never from the other grains unless the outer sections are ground off as in pearled barley. Grains simply hulled or husked and slightly crushed are called groats or grits; more finely crushed they are termed meal, and when ground into a fine powder and sifted they are known as flour.
Grains in the raw state are not usually considered pleasant to the taste and are thought to be difficult of digestion, and therefore cereals are almost always cooked before eating. The simplest and doubtless the oldest way of cooking them was by parching. This was frequently all that was done to the oats which the Scotch Highlanders took as their only provision: in their border forays, or to the corn the American Indians used for a similar purpose. But other ways of cooking make the grain more palatable, and it is usually mixed with water or other liquid and either baked as bread and cakes or boiled or steamed as pudding or porridge. It is the use of cereals as porridge that is of special interest, as cereal breakfast foods are most commonly used in America for porridge making or as a substitute for porridge. When used in this form they are perhaps not as convenient to eat as bread, do not keep so well, and require long cooking, but in spite of these disadvantages porridge is much used the world over, and grains have been thus cooked since earliest times. Many varieties of porridge are found. Sometimes the cereals are simply boiled in water, sometimes with milk, or with meat or kale, as in Scotch brose. Welsh budrum is made from oats which have been allowed to ferment and are then cooked, and the Arabs have a similar dish, kouskous, made from fermented wheat. In the old-fashioned bag puddings of England, of which Christmas plum puddings are the direct descendants, suet and fruit were mixed with wheat or barley and all steamed together in a bag. The simpler kinds of porridge are, however, the most common, and it is from them that modern cereal breakfast foods have been developed.
The number and variety of cereal breakfast foods at present on the market are large, but the majority of them fall readily into one of three groups. The first includes those which are prepared by simply grinding the grain, the second those which have been steamed or otherwise partially cooked and then ground or rolled, and the third those preparations which have been acted upon by malt, which induces a greater or less chemical change in the starch present.
No class of foods is more extensively or ingeniously advertised than the cereal breakfast foods. The claims sometimes made for them are astonishing. Some of them are said to contain several times as much nourishment as the same weight of beef; others are lauded as especially valuable as brain food or nerve tonics, and very many are claimed to be particularly well suited for persons of weak digestion. Many of these claims are obviously preposterous, other are doubtless true, and still others contain an ingenious mixture of fact and fancy. Realizing that accurate information in regard to breakfast foods was needed, investigators
at several agricultural experiment stations have. recently studied their composition and food value, and it is now possible to make a number of definite and reliable statements about them.

## SCIENCE NOTES

In 1892, Frank Mira, of Jacksonville, Fla., discovered a twig which seemed to him of some use to the perfumer. He submitted it to Mr. E. Moulie of that city, who was engaged in the business of extracting essences The plant immediately interested Mr. Moulie, who succeeded in producing from it an essential oil. Many attempts on the part of Mr. Moulie and the United States Department of Agriculture to ascertain the scientific name of the plant finally resulted in its identification as Mentha citrata, a very rare plant which is popularly called bergamot mint. From year to year Mr. Moulie has increased and developed the few plants which he has been able to obtain, and is now engaged in gratuitously distributing the plant for general propagation. We believe that in this manner a very valuable perfume industry may some day be built up on the cultivation of this rare plant.

A curious result of the frequent and severe seismological phenomena which have disturbed the earth in various parts of the world during the past few months, has been observed in connection with the water wells of Leicestershire, England, from which the inhabitants derive their drinking supplies. Whereas a few months ago the water obtained was sparkling and transparent in purity, during the latter months of the summer it became appreciably deteriorated. Little attention, however, was paid to this peculiarity, which was set down to the long drought and the probability that the wells were becoming exhausted somewhat, until animals refused to partake of it. The water became so highly discolored as to be practically opaque, as if heavily impregnated with yellow clay, while instead of being perfectly odorless it had a distinct smell resembling paraffin. This peculiarity led to the water being tested with a light to determine the possible presence of oil, and immediately it became ignited. Samples were then drawn and permitted to stand for several hours, during which period a thick oleaginous scum rose to the surface, while yellow sediment gathered at the bottom. The oil has been found to be petroleum, the presence of which in the district has never before been detected. A scientist, however, who has investigated the water states that twenty years ago, when the earth was similarly disturbed by earthquakes, a similar effect was produced, and the phenomenon is closely associated with the violent disturbances that have taken place recently in the earth's crust.
Prof. Omori, the eminent Japanese seismologist who has been studying the effects of the Californian earthquake for the past three or four months, has come to the conclusion that California will be free from seismic disturbances for half a century, and probably for a much longer time. He says that in all probability there will never again be so severe an earthquake in California as the one on April 18. The slipping of the crust of the earth was caused by the fact that at the point of weakness it was in unstable equilibrium, resulting from the redistribution of matter. It takes ages to bring this about, and the crust has probably settled to a position in which it will remain for centuries without any slipping. The position of countless tons of matter will have to be changed, and vast quantities of earth to be carried by the rivers into the sea, before there will be so great a redistribution of matter as to cause an earthquake. Prof. Omori says that he is confirmed in this opinion by the occurrence of many minor shocks since the great one, and by the manner of their occurrence. These shocks have been coming at regular intervals and diminishing in force, showing that the crust of the earth is slowly settling to rest in its new position. The minor shocks occur most strongly when the barometric pressure of the atmosphere is greatest. Most of the shocks are so slight that they can be discovered only by the aid of a seismograph, and are of nosimportance except as helps to an understanding of earthquakes. The professor says that an earthquake of any magnitude is preceded by a series of minor shocks, especially if the observation is made at a location distant from the center of disturbance. Tremors precede the great shocks, frequently by several days. If, therefore, careful observations of these tremors could be made, it might be possible to predict an earthquake. Prof. Omori recommends that bureaus, equipped with seismographs, be established all over the State of California, so that slight tremors may be observed and their effects carefully studied. When a shock occurs, reports would come in from many quarters to the chief observatory, and the center of the disturbance could be located quickly. The Japanese professor will nublish a full report of his observations during his visit to California.

## THE NEED AND THE TESTING OF PURE DRUGS. by hugo erichsen

It is, perhaps, not commonly realized that the druggist, by reason of necessity, occupies a position of trust toward the entire community. The helpless, the sick, the physically weak, yea, even the dying, rely upon him absolutely for safety, accuracy, and skill in the preparation of the physician's order. It would be idle to deny that cases have been known in which pharmacists betrayed their trust, but such, happily, were few in number and pertained mostly to the atrocious crime of drug-substitution. This offense is as contemptible, deliberate, and cowardly as a stab in the dark, for in most cases it constitutes a criminal act difficult to prove and against which the victim has no redress whatsoever. Even the atmosphere of the sickroom has been contaminated with the spirit of commercialism and individual greed that seems to have so thoroughly infected our so-called modern civilization. While the integrity of the average pharmacist is all that could be desired, yet he is liable to dispense prescriptions that are not what they purport to be, in consequence of the use of drugs that are either partly or wholly inert. Most druggists have neither the time nor the facilities for making a careful investigation of the physiological action of the many drugs that compose their stock. But that work of late is being done for them, on a large scale, and will eventually revolutionize the drug trade.
Years ago, many manufacturers merely complied with the directions of the United States Pharma copœia, providing for the selection of the drug by more or less superficial means and its exhaustion by a given menstruum (solvent) to the production of a stated yield. But a leading firm of manufacturing chemists went a step further and attempted to gain some insight into the value of the more powerful drugs by estimating their content of active constituents. Tnis work was attended with much expense and also great difficulty because of the lack of satisfactory methods of procedure. Nevertheless they persevered, and as a result were soon able to arrive at comparative results, which showed to their astonishment that different lots of such drugs as quinine, bella donna, hyoscyamus, nux vomica, and others varied widely in the proportion of the active constituents they contained; that in fact it was the exception rather than the rule to find successive lots of any given drug to be possessed of uniform activity.
The extent to which a drug is contaminated depends, of course, largely upon its commercial value and the ease with which it may be simulated. Drugs like opium and crocus, for instance, are frequently adulterated and fraud is also widely practised in connection with the "manufacture" of pow dered chemicals, resinoid or inspissated substances Although time has wrought an improvement in that respect since cas cara sagrada was first in troduced to the medical world, that drug is still the object of shameless substitution. Questionable preparations of it are at fault, either because the bark employed in making them is not genuine or has not been promer cured and extracted. .ark less than two years old contains an active fer ment that gives rise to unpleasant after-effects and must therefore be consid ered impure. Other plants are often mixed with strophanthus; there are about thirty varieties of this plant, of which only six contain strophantin, the active principle
The senna of commerce is frequently adulterated and unsophisticated buyers are sometimes supplied with Tinnevelly senna in


Room in the Laboratory in Which Animals Are Kept While Being Used for Experiment.


Testing a Remedy on a Guinea-Pig.
fhe need and the testing of pure drugs.
donna and white bryonia are sophisticated with the root of a plant designated botanically as Medicago sativa and genuine calumba root with what is known as false calumba. Artificial substances are often employed to adulterate Japan camphor
The quality of coca and that of the cinchona bark of commerce varies greatly, which accounts for the fact that the therapeutic effect of some of these drugs is so slight that they may almost be regarded as worthless. Dill and anise are used as the adulterants of conium. False jalaps are not uncommon in the market and sophisticated manna has been described by several authorities. The scammony of wmyrna is frequently displaced by a substitute manufactured in the south of France and the large or false senega of the trade palmed off for the much higher priced true senega. Much of the musk upon the market must be regarded with suspicion, as the high price of the odoriferous article invites imitation. The leaves of vva ursi are often intermixed with the inert leaves of other umbelliferous plants.
The foregoing constitutes a powerful argument why physicians and druggists should avoid questionable medicinal products and give preference to medicaments that are entirely reliable, even though they may be a trifle higher in price. Only the larger laboratories in the country possess the necessary facilities and capital to manufacture a full line of first-class pharmaceuticals. They are imbued with a sense of responsibility and are aware of the fact that their reputation depends upon the nature of the goods they market. Abundant means enable them to engage experts who exercise great care in the selection of crude rugs and reject all materials that do not come up to the standard. Moreover, the gathering of the drug plants is under the direct supervision of men who are thoroughly posted in regard to the pharmacological features of the plant they are looking for. Before the remedy is placed upon the market, it is standardized, that is to say, subjected to tests that determine its therapeutic value and insure uniformity. Having decided upon a standard, the drug is extracted by the proper menstruum, in the most approved manner, assayed chemically, and "standardized" by concentration or dilution as required.

But there are certain powerful drugs, such as the heart tonics, digitalis, strophanthus, and convallaria; the powerful arterial sedative aconite, ergot, cannabis indica, squill, and others equally important that cannot be assayed by chemical processes.

Happily, the method of physiological assay is now available, and practical use is made of the fact that certain of these drugs will produce characteristic physiological effects upon certain animals. For instance, good ergot blackens the comb of the cock, while an inferior specimen fails of effect. The therapeutic value of the heart tonics is measured by means of delicate apparatus which accurately determines the effect of graduated doses upon the cardiac mechanism of frogs. These amphibians are also employed to determine the maximum and minimum dosage of standard preparations of strophanthus.

The medical man is groping in the dark when he prescribes a preparation of unknown strength, the first dose of which may prove ineffective, or possibly poisonous. Under such circumstances he is virtually compelled to make a physiological test upon his patient. Gradually the dose must be increased or diminished until he finds that a definite amount produces the effect desired. But should the prescription be refilled with a
preparation from another manufacturer, or by another apothecary, the correct dose must again be determined experimentally as before. When drugs are standardized by chemical assay or physiological test, however, the physician escapes the humiliation of palpable impotence in the face of danger and there is no occasion for needless experiment at the bedside, where so frequently prompt drug action saves lives.

A RETROSPECT OF THE VANDERBILT CUP RACE.
That the third contest for the Vanderbilt cup was the most successful of the three that have so far been held, is to be credited largely to the great care and good judgment with which the Cup Commission and the officials in charge of the preparation of the course performed their several duties. Special care had been taken to safeguard both the contestants and the multi-
tudes that swarmed out to view the race; and if the onlookers had shown a proper appreciation of the efforts made for their protection, the injuries and accidents which marked the race would have been almost entirely absent. When it is borne in mind that the crowd deliberately tore down the fences which had been put up to keep them off the track, that they swarmed entirely across the road, and refused to draw


Engine of the Locomobile, Showing the Arrangement of the Carbureter, Inlet Valves and Igniters.


The De Dietrich Racer, Which Finished Third, Ascending a Hill Near Roslyn.


Panoramic View of the Hairpin Turn at Old Westbury, Showing Tracy Starting to Round It in His Locomobile.


Jenatzy Finishing. The Veteran Belgian Driver Obtained Fifth Place With a German Mercedes Car.
Time, 5 hours, 4 minutes, 38 seconds. Average speed, 58.51 miles per hour.


Wagner, on the Winning Darracc, Passing Through the Crowd at High Speed Just Before He Crossed the Finish Line.
Time, 4 hours, 50 minutes, $10 \frac{2}{6}$ seconds. Average speea, 61.43 miles per hour.


Valve Side of the $\mathbf{1 0 0}$-Horse-Power Darracq Engine, Showing the Branched Inlet Pipe and the Four Separate Exhaust Pipes. The V-Shaped, Finned-Tube

Radiator Is Shown at the Left.


Tracy Putting on Full Power at the Last Bend in the Hairpin. This Machine Made the Fastest Round in 26:21-an Average Speed of $\mathbf{6 7 . 6 5}$ Miles per Hour.

| Machine | H.P. | Driver | 1st lap | 2d lap | 3d lap | 4th lap | 5th lap | 6th lap | 7th lap | 8th lap | 9th lap | 10th lap |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Darracq |  | Wagner | 28:26 | 27 :56 2/5 | 28:171/5 | 27:41 2/5 | 32:09 | 27:22 | 27:41 | 30:45 | 27 :54 | $31: 58$ |
| F. I. A. T..... | 120 | Lancia | 30:27 | 29:34 | 28:54 3/5 | 28:17 2/5 | 28:17 | 33:02 | 28:21 | 28:39 | 29:06 2/5 | $28: 593 / 5$ |
| Lorraine-Dietrich | 120 | Duray | 30:18 | 28:52 3/5 | 28:10 1/5 | 32 :57 1/5 | 28:26 2/5 | 29:45 3/5 | 28:04 | 31:09 | 28:00 | $27: 52$ |
| Bayard-Clement | 100 | Clement | 31:21 | 33:31 | 28:44 3/5 | 28:17 2/5 | 36:32 | 29:22 | 28:10 | 28:18 | 29:32 | 28:114/5 |
| Mercedes | 120 | Jenatzy | 30:02 | 30:16 | 29:09 | 28:05 | 34 :34 1/5 | 28:384/5 | 28:22 | 28:17 | 37:44 2/5 | 29:293/5 |
| 1. I. A. T.. | 120 | Nazzaro | $30: 41$ | 35:03 1/5 | $41: 23$ 4/5 | 34:21 | 29:21 | 28:57 | 31:49 | 27:57 | 27:25 2/5 | Still running |
| Itàla |  | Cagno | 36:173/5 | 35:20 | 32:27 2/5 | 33 :13 3/5 | 38:192/5 | 30:59 | 32:09 | 31:44 | $35: 58$ 4/5 | Still running |
| Thomas | 115 | LeBlon | 57 :32 3/5 | $31: 42$ 2/5 | 30:47 | 30:07 | 30:33 | 38:38 | $30: 56$ | 30:49 | $31: 212 / 5$ | Still running |
| Panhard | 120 | Heath | 39 :50 | 39:22 3/5 | 34:25 2/5 | 33:33 | 33:29 | 36:34 | $35: 48$ 3/5 | 34:074/5 | Still running |  |
| Locomobile | 110 | Tracy: | 38:48 | 38:53 | 44:51 | $31: 37$ | 26:21 | 38:23 2/5 | 40:26 | $33: 573 / 5$ | Still running |  |
| Mercedes |  | Luttgen | 34:32 | 32:14 | 32:14 3/5 | 30:412/5 | 34:04 | $50: 12$ | 37:36 3/5 | 33 :14 2/5 | Still running |  |
| Itala | 120 | Fabry | 41:28 | $35: 212 / 5$ | $36: 572 / 5$ | $38: 043 / 5$ | 33:49 2/5 | 37 :12 3/5 | 38:44 | Still runn |  |  |
| Christie | 50 | Christie | 34:07 3/5 | $33: 38$ 2/5 | 35:15 2/5 | 45:34 | 57 :40 | 35:02 | 37:38 | Still runn |  |  |
| Haynes | 60 | Haynes | $45: 18$ | $34: 354 / 5$ | 34:14 1/5 | $44: 273 / 5$ | 35:58 2/5 | 47:31 | 39:23 4/5 | Still runn |  |  |
| Hotchkiss | 120 | Shepard | 32:26 | 31:374/5 | $30: 541 / 5$ | 30:23 | 33:53 | 30:23 3/5 | Killed a | tor and re |  |  |
| Frayer-Miller | 110 | Lawwell | 33:34 | 1:20:40 4/5 | 36:114/5 | 39:57 2/5 | Retired wit | broken fan |  |  |  |  |
| F. I. A. T.... | 120 | Weilschott ....... Broke steering gear |  |  |  |  |  |  |  |  |  |  |
| Mercedes | 120 | Keene .......... Did not start, broken cylinder. |  |  |  |  |  |  |  |  |  |  |

back to the side lines until the cars were almost upon them, it is truly marvelous that the accidents should have been so few. This behavior of the public was unsportsmanlike and extremely unfair. It added greatly to the difficulties of the drivers, most of whom were from foreign countries and therefore, in a sense our guests. All of the drivers agreed that the speed would have been far greater than it was, if the public had only kept clear of the track and had not, at critical points, obscured the view so badly. The interference was particularly bad at the turns, where, as the winner Wagner stated after the race it was very difficult to determine just when to slow down and just where to commence to give the neces sary degree of "helm" to the steering wheel. Several of the foreign drivers stated that they would never again race under conditions similar to those that ob tained on October 6. Hence we are pleased to note that at a recent dinner of the Vanderbilt Cup Com mission, it was positively announced that any future race would be held over a private racing course.
Apart from the inexcusable misbehavior of the pub lic, the race of this year was an unqualified success, and although the result proved that the foreign mak ers still hold a considerable lead over our own, at least in the matter of building purely racing cars, there is satisfaction in the thought that the best car and the best driver won. Although the speed of the winning Darracq car last year ( 61.49 miles per hour) was slightly greater than the speed ( 61.43 miles per hour) of the winner this year, the average speed made by the five leaders was much greater than last year. This fact, coupled with the fact that practically all of the cars were running when the race was called, proves that the last twelve months have seen a decided im provement in the art of automobile manufacture Moreover, everybody who followed the race closely must admit that the failure of the American cars was due chiefly to tire troubles, and not so much to de fects in the machines themselves. It was the splendid quality of the tires used by the foreign machines, and the fact that all of them carried detachable rims, which contributed so largely to their better showing On account of a slight rain which fell just previous to the race, the oiled road was rendered somewhat slippery, and non-skidding tires, with roughened metal treads, were found to be necessary. Although most of the foreign cars started with tires of this kind, the American cars unfortunately did not use them at the start. At the end of the first round Tracy, driving a 110-horse-power Locomobile, had his tires changed for those of the steel-banded non-skid type. When the ire company's supply of this type was exhausted, tires having steel-studded leather bands were substituted None of the American non-skid tires showed the en durance of the foreign ones, and, as we have stated it was largely for this reason that the American cars or at any rate those of the normal type, made no bet ter showing. That the speed was not wanting in at least one of these, is shown by the fact that the fast est round of the race was made by Tracy, who drove his Ldcomobile over the fifth lap of the course in 26 minutes and 21 seconds, which is equivalent to a speed of 67.65 miles an hour. It is estimated that on account of the many slowdowns at the turns, this machine must have been traveling at over 100 miles an hour on this round on the straight.
The 115 -horse-power Thomas car, driven by the Frenchman Le Blon, was leading the American cars and was in eighth position when the race was called off, Le Blon being at that time on the last lap. Next to him of the Americans came the Locomobile, which was running on the ninth lap, being then in tenth po sition. The next American was the Christie machine driven by its owner and builder, which was running
in the thirteenth position on the eighth lap; and in the fourteenth position and also on the eighth lap was the 60 -horse-power American Haynes touring car, which by the way did not make so good a showing as to speed as it did in the elimination race of two weeks before. Except for tire troubles, Christie's little 50-horse-power touring car made such consistent running as to excite the wish that he could have been steering the powerful 100 -horse-power racer which was dis abled during his training for the elimination trial The last of the American cars was the Frayer-Miller air-cooled car, which retired on the fifth lap with a broken fan. The experience of the three Frayer-Miller cars, each of 110 horse-power, seems to indicate that although this type is admirably adapted for touring cars, in which it has shown excellent results, it is not quite equal to the severe demands which are made when the horse-power exceeds 100, and the machine has to be pushed for five or six hours to the utmost limit of its capacity.

The performance of the winning Darracq car was highly creditable both to the maker of the machin and to its driver, young Wagner. Considering the crowded condition of the course and the loss of speed due to the use of non-skid tires, the speed of 61.43 miles an hour, at which the race was won, compares favorably with the speed made last year with faster tires and over a course that was less crowded and included fewer turns. The driving of Lancia, who came in second and whose average speed was 60.84 miles an hour, came fully up to the reputation of this great driver, who was the winner in last year's race, in which for 200 miles he averaged 72 miles an hour; and his failure to take the cup was undoubtedly due to the fact that his successful rival was driving a car that was just about an even minute-to-the-lap faster than his own. Duray driving the Lorraine-Dietrich car at an average speed of 60.27 miles an hour was a close third to Lancia, whose average speed was about one half a mile per hour faster. The fourth machine, a Bayard-Clement, driven by young Clement, was one of the steadiest-running and most perfectly guided cars in the race, and in spite of minor troubles neces sitating frequent delays, it carried Clement into fourth position at an average speed of 59.02 miles per hour. Fifth position was won by the popular driver Jenatzy in a 120 -horse-power Mercedes, his average speed being 58.51 miles per hour.

Of the eighteen cars entered, two only may be said to have possessed features which differed broadly from the prevailing type. These were the two American cars, the air-cooled Frayer-Miller and the direct-drive Chris tie. The other sixteen were alike on all the broad features of their design, except one. Seventeen of the cars entered were driven by four-cylinder engines located over the front axle, and of these, eight were driven by shaft and bevel gears, and nine carried the chain drive. Particular interest centers, of course, in the winning car, which, in its dimensions and details of construction, differed somewhat from the rest of the machines. Its wheel base was short and its tread comparatively narrow. The small wedge-shaped radiator and the absence of the usual bonnet over the engines combined to make the machine look smaller and lighter than it really was. As a matter of fact, at the weighing-in it was found to be close to the weight limit. Throughout the race it ran with beautiful regularity, and as it swept by the grand stand it ap peared to possess excellent steering qualities.
As to the prospects of the race for the cup in 1907 being held in this country, we think that, in view of the fact that a private course, free from dangerous obstruction, is to be secured, we may see the race run off here, and run off, moreover, under ideal conditions Although the cup was won by a French machine,

France was not officially represented, the entries being made by owners in a private capacity. An Italian ar was second in the race, and, of course, the Italians have the privilege of running the race off in Italy, if they so desire. But it is quite conceivable that the attraction offered by a private and special course may prove sufficient to make them forego their right of location in favor of America

## The Latest Death Test.

Although it is asserted by nearly every practising physician that the possibility of being buried alive can only occur where a medical examination has not been made, an eminent German physician and surgeon states that a stronger, absolutely reliable guaranty for discerning actual death is still demanded, and the demand has been met by the discovery of a new medium for ascertaining death with perfect certainty. This new death test consists in injecting a solution of fluorescine deep into the tissues. If circulation exists, the skin and mucous membranes become very yellow and the eyes assume the color of emeralds; if the circulation has ceased, none of these results occur. The discoverer proposes that at least two hours before the body is placed in a coffin, such an injection with luorescine be made. If life is not yet extinct the injection does no harm, and the coloring within a short time entirely disappears without the slightest injury to the patient.

A New Process for Making Malleable Iron and Steel. A new process for directly converting iron ore into malleable iron or steel by a continuous system has recently been made by two Australians, Messrs. Heskett and Moore. It is claimed that the new discovery will effect a saving of 25 per cent in the manufacture. The ore is simply concentrated by ordinary methods, or if it is magnetic it is separated electrically until the pure oxide of iron is obtained. The oxide of iron is passed through a revolving cylinder heated by waste gases from subsequent operations, and brought in that cylinder to a dull red heat. It drops from the cylinder to a second similar cylinder, and in the latter it s brought into contact with the deoxidizing gas, which is forced through and brought into contact with the heated ore. The heated ore is thus converted into a pure iron. Accompanied by and protected by the deoxidizing gas, it is passed into a third chamber or melting hearth, where it falls into a bath of molten ron, and is converted directly into steel or balled up as malleable iron.

## A New Book Catalogue.

The publishers of the Scientific American have had a new Book Catalogue in preparation for some time, and it is now ready for distribution. Copies are being mailed to all subscribers of the Scientific American, Scientific American Supplement, and American Homes and Gardens. Those who read the Scientieic American in the libraries of the Y. M. C. A., or purchase the paper at newsstands, can obtain a copy on application. The Catalogue will be sent free to any address in the world. It contains 112 pages and over 5,000 titles and lists. Special attention has been given to classification in order to render reference easy. We should be pleased to send copies of the Catalogue to any friends of our readers who may be interested in scientific or technical books.

If metallic iron is melted along with copper or brass, it is said that part enters the alloy and becomes chemically combined, and the remainder separates in pellets or nodules of the hardness of steel. These nodules are the source of much trouble in brass, as they injure tools to an alarming extent.

## (1)dxxemprandence.

## The Vacuum Process of Preserving.

To the Editor of the Scientific American:
Referring to the article on the "Vacuum Process of Preserving," in your issue of September 8, I take pleasure in giving you below the answers to the questions in this article and have added other information, which may be of interest to your readers:

1. Yes.
2. Vacuum pressure will not destroy bacteria.
3. The degree of heat required to destroy bacteria varies in every variety of fruit or vegetables.
4. Yes; temperature to destroy bacteria varies according to article to be preserved. This process is used in canneries, but it spoils the fine flavor of the article, and is the reason why canned fruit is inferior to the article put up in homes. Fruit to retain its fire flavor should never be cooked twice.
5. Yes.
6. No.
7. We do not know the source of life of germs; the source of life of anything has not yet been discovered. 8. It is difficult to classify them, as there is such a great variety of germs.
8. None will be destroyed.
9. No.
10. Probably same length of time and same degree of heat.
11. There is no such thing as an absolute vacuum; it has never been obtained with pumps or other scientific apparatus.
12. I do not know the exact degree of vacuum which has been obtained so far.
13. They would not necessarily keep.
14. No.
15. No; its action is not suspended.
16. Perhaps not indefinitely, but enough to spoil the food.
Your correspondent has evidently been under the impression, which is shared by some canners, that a vacuum will destroy germs. To fully understand the vacuum process of canning, we must distinguish between the bacteria floating in the air and those contained in the food itself.
Every process of canning in vogue so far, even with the old style Mason jar, is to some extent vacuum canning. The difficulty in opening Mason jars is caused by the vacuum which was formed at the time the food was put up.
Fruit and vegetables will begin to ferment almost immediately after they have been picked or taken from the soil. Tomatoes will ferment quicker than other fruits or vegetables, and this is the reason why a great many people experience difficulty in preserving same; while they are apparently fresh, fermentation has progressed already so far that only cooking for a very long time will destroy the fermentation.
To put up fruit in canneries in glass jars and to retain its best flavor, the bacteria in the fruit and those floating in the air should be destroyed at the same time, so as to avoid cooking the fruit twice. This can be done $b_{y}$ fastening the cover to a jar partially, that is, so that part of the air and the steam can escape, but the greater part of the steam rising from the fruit will come in contact with the cover and by condensation drop back into the fruit.
When the fruit is cooked sufficiently, the cover should be fastened quickly, and upon the jar cooling off a vacuum will be formed.
In addition to this, there is the air which is contained in the fruit itself, which also becomes rarefied during the process of cooking. This rarefied air rises to the top when the jar is cooling and to some extent helps to preserve the fruit. This is most noticeable in preserving apples. A quart jar, which was filled brimful with apples, showed on cooling a shrinkage to one inch from the top, this being caused by the rarefied air leaving the fruit and rising to the top.
Chicago, Ill.
Richard Murr.

## Sun-Spots and Earthquakes. <br> To the Editor of the Scientific American:

I see by a dispatch in the daily press that the earthquake in Chile on August 16 was foretold by astronomers there, who based their predictions on the conjunction of Jupiter, the earth, and the moon. The prediction was published in the newspapers there on the day before the catastrophe. Another dispatch from London states that Sir Joseph Lockyer, director of the Solar Physics Observatory, Kensington, says it is a remarkable fact that "the earthquakes in San Francisco and Valparaiso synchronized with a sunspot maximum, and that in 1894, when there were many serious earthquakes, the same conditions obtained," suggesting that the point is well worthy of investigation.
You published three communications of mine four years ago-on June 21, July 26 , and September 27 , 1902-upholding these theories that volcanic and seismic actions are partly caused by planetary positions
and also by sun-spots; so then let us see how the recent big earthquakes coincide with certain planetary aspects, for it is at least remarkable, whether we admit a cause and effect relation or not.
A very close conjunction of Saturn and the moon with the earth, amounting to nearly an occultation, took place at $2: 45 \mathrm{~A}$. M. of April 19 last. The big earthquake that visited San Francisco-and also this place, which is 30 miles distant-and was the severest ever known here, took place at $5: 13 \mathrm{~A}$. M. of the 18th, some twenty-two hours before.
There was a conjunction of Jupiter and the moon on August 15 at 1 P. M., and a close conjunction of Mars and Mercury on August 17 at 12 M . The earthquake in Chile came at $7: 52$ P. M. of August 16, about midway between the two influences, the first shock lasting $41 / 2$ minutes and the second 2 minutes, and several hundred more were felt during the following few days, continuing through the conjunctions of Mercury and the moon and Mars and the moon on the 18th, full moon and eclipse on the 19th, and moon on the equator on the 21st.
I wish to call your especial attention to the planetary positions of September 2 to 5 , for if there is any truth in this theory of the cause of seismic and volcanic disturbances, they should surely be at a maximum at that period. On September 2 we have full moon at 3 P. M., and the occultation of Saturn by the moon at 7 P. M.; on September 4 Mercury is in perihelion at 7 A. M.; a very close conjunction of Mars and Mercury occurs at 6 P. M., with Mars only 9 min . north, and the opposition of the great planet Saturn with the earth and sun takes place at 7 P. M. Seismic, volcanic, and electric disturbances of many kinds may be expected on and near these dates; also at new moon, moon on equator and perigee, on September 18, 19, and 21 respectively, and at the occultation again of Saturn by the moon on the 29th at 11 P. M.

We are also near the earth's and Saturn's equinoxes, both coming at nearly the same time; hence the unprecedented seismic unrest. A dispatch from Berlin of August 30 says: "The weekly earthquake report of the Geophysical Institute of Goettingen University shows that there were eight earthquakes last week and twenty the previous week. These figures are the highest ever recorded."
Whenever three or more members of the solar system come nearly or directly in line with each other, or one crosses the plane of another's equator, more especially if unusually near to each other, as in close conjunctions and oppositions, equinoxes, perihelions, and perigees of the seven planets, moon, and sun, electrical disturbances seem to be caused throughout the solar system. As to how this occurs, the foilowing theory may account for it: There is probably a perpetual interchange of electrical energy between each two members of the solar system-to maintain an electrical equilibrium, as it were. (we know that sun-spot disturbances are communicated to the earth with the speed of light, causing magnetic aberration.) Now, electricity travels, of course, along the line of least resistance, but as in space the resistance is uniform, electricity travels between planets by the short est distance-a straight line. Then, when three or more planets come in line with each other or the sun, there would be more interchanging of electricity than usual, and the nearer to each other, of course the more so. One planet might have at times more positive than negative electricity, and others vice versa, or more of both than another planet, and an equilibrium would be set up by mutual exchange when they came in line. Also, electricity may be supposed to be thrown off from a planet in all directions along the plane of its equator, hence when this plane intersects another planet we have electrical interchange and unrest. All of which reminds us that what we do not know about electricity and its behavior under certain conditions would "fill a big book," as the saying goes. The theory of planetary causes of electrical disturbances is by no means new or original, as will be seen by the following extracts from a work on "The Sun" by C. A. Young, Professor of Astronomy in the University of New Jersey, published in 1881:
"There is no question of solar physics more interesting or important than that which concerns the cause of this periodicity [of sun-spots], but a satisfactory solution remains to be found. It has been supposed by astronomers of very great authority that the action of the planets in some way produces it. Jupiter, Venus, and Mercury have been especially suspected of complicity in the matter, the first on account of his enormous mass, the others on account of their proximity. De la Rue and Stewart deduce from their photographic observations of sun-spots, between 1862 and 1866, a series of numbers which strongly tend to prove that, when two of the powerful planets are nearly in line as seen from the sun, then the spotted area is much increased. They have investigated especially the combined effect of Mercury and Venus, Jupiter and Venus, and Jupiter and Mercury, as also the effect of Mercury's approach to, and recession
from, the sun. In all four cases there seems to be a somewhat regular progression of numbers, though much less decided in the third and fourth than in the first and second. Loomis suggests that the conjunctions and oppositions of Jupiter and Saturn may be at the bottom of the matter."
In your article on "A Severe Earthquake in South America" in issue of August 25 , you mention three other severe earthquakes occurring there recentlythe dates being March 27, April 24, and May 5. On referring to the almanac I find: March 27, 7 A. M., conjunction of Mars and moon; March 28, 2 A. M., conjunction of Mercury and Venus; April 23, 9 A. M. new moon; April 24, 7 P. M., conjunction of Venus and moon; April 25, 8 A. M., conjunction of Mars and moon; May 5, moon on equator; May 6, 6 A. M., conjunction of Venus and Mars, Mars north 5 min . There are thus seen to be in the first case two earthquake causes but nineteen hours apart; in the second, three causes in less than forty-eight hours, and in the third, two strong causes in thirty hours, including a very close conjunction. There are but three other dates in March-12, 13, and $25-$ when the earthquake-planetary causes are so strong; four in April-8, 9, 10, and 18; and three in May-17, 23, and 24.
I would like to see this theory of planetary causes fully worked out and tested, by considering not only the conjunctions and oppositions as seen from the earth, but all lining up of the planets with each other or the sun, and also the equinoxes of the planets and principal satellites. A means of accurately predicting sun-spots, earthquakes, volcanic eruptions, and electrical disturbances in general might be developed.
Livermore, Cal.
Elmer G. Still.

## A Motor Vehicle Test.

Plans for a commercial motor vehicle test have been made by the Automobile Club of America. The contest, which will be an economy test, will be held from November 7 to 10 , the competing machines being subjected to different tests on each of these four days.
The competing cars will probably not be divided into classes, but will conform to the same regulations, and awards will be made on the basis of the cost of work done per ton mile. If these figures can be obtained with a tolerable degree of accuracy they will be not cnly interesting, but of wide industrial value, for one of the great difficulties to-day in determining the economical utility of the motor vehicle for business purposes is the lack of trustworthy statistics in determining what similar machines ought to do under practically similar conditions.
The plan as at present proposed is to require the competing cars to run over two routes. One will be the long route, extending from the clubhouse to Kingsbridge, at 230 th Street, by way of Central Park West, Amsterdam Avenue, and Upper Broadway, returning by way of Sedgwick Avenue, Jerome Avenue, over Central Park Bridge, down Seventh Avenue to the Park, and then to Fifth Avenue, back to the clubhouse. This will be a twenty-mile route. The shorter route, of ten miles, will run south down Fifth Avenue and Broadway to the Battery, returning by way of West Street, thus taking the cars through the most congested traffic sections of the city.

## The Current Supplement.

The current Supplement, No. 1607, opens with an article on the flamingo and its queer nest, in which article are described the researches of Frank M. Chapman in Bermuda. Striking illustrations accompany the article. Major Ormond M. Lissak describes methods of measuring the velocities of projectiles and pressures in cannon. Internal strains in iron and steel are discussed by Henry D. Hibbard. Those who are interested in the new alcohol law will, no doubt, welcome the publication of a digest of the regulations which have recently been issued by the Internal Revenue-regulations which will definitely settle in what manner alcohol may be made and denaturized under governmental supervision. The work of the Reclamation Service is described and illustrated. Percy H. Thomas discusses some fundamental characteristics of mercury vapor apparatus. The Atkins dry process of generating acetylene gas is described by the English correspondent of the Scientific American with the help of diagrams and photographs. A 50 -horse-power four-cylinder Crossley vertical oil engine with a new system of governing forms the subject of an interesting article. The usual trade notes and formulæ will be found in their accustomed places.

A parliamentary return has been obtained by Sir Charles Dilke giving the numbers of submarines built or in course of construction for the leading naval powers. France stands at the head of the list with 39 ouilt and 50 in course of construction; Great Britain stands second with 25 built and 15 on the stocks; Russia's figures are 13 and 15; United States 8 and 4; Italy 2 and 4; Japan 5 and 2; and Germany has one submarine in course of construction,

## the canadian pacific Railway company's IRRIGATION PROJECT. <br> by kittredge wherler.

The Province of Alberta, which is seven hundred miles long and four hundred miles wide, is situated west of Saskatchewan, east of British Columbia, and north of Montana. The southern part of this great province is called Sunny Alberta, and the name is well earned. It is a land of mild winters and of perennial
able and non-irrigable areas in desirable proportions for grazing and crops, for ordinary and intensive farming.

In laying out this undertaking, the block has been subdivided into three main divisions of eastern, central, and western sections, containing about $1,000,000$ acres each. The irrigation development is beginning with the western section.
The great plain comprising the block has a natural
sive undertaking. The engineering surveys have been rigidly scientific and exhaustively performed, the contours of the entire western section being located to 5 -foot intervals. In the two remaining sections of over $2,000,000$ acres it is intended to complete the topographical surveys to show contour elevations within the remarkably close scale of one foot, and in all the sections the maps issued show the exact acreage of irrigable land on each farm.


## A Standard Highway Bridge.

sunshine. The soft kiss of the Japan current and the warm breath of the Chinook winds are felt through its sheltered valleys and over its open plains, and horses and cattle range at will the winter through without being fed or sheltered.
The main water supply is the noble Bow River, which heads the Great Divide well up in the very heart of the Rockies, whose peaks are covered with perpetual snow; whose deep and rugged chasms are the glacier's home, and therefore the source of an inexhaustible water supply-the winter's store for summer's need. Unlike many other rivers, the banks of the Bow are not deep-cut below the plain, but are near the lands to be irrigated, and the supply at low water is more than double the demand.

In Canada all the rivers belong to the crown, and are under the immediate supervision of the government; they are measured and meted out by government officials, so that the water right is as good as the land title, and the stipulated supply is guaranteed with both.
The great tract to be irrigated by the Canadian Pacific Railway Company lies in southern Alberta between Calgary and Medicine Hat. It is one hundred and fifty miles in length and forty miles in width, lying betwēen Red Deer River on the north and the Bow River on the south, and through its very center runs the iron way of the Transcontinental Railway.
This great irrigation block is the largest individual block on the continent, comprising over $3,000,000$ of acres, and it presents the happy comb.nation of irrig.
incline from west to east of some eleven hundred feet, and lends itself readily to the location of the great canals and secondary ditches. The main canal of the western section heads in the Bow River, about two miles east of Calgary, and is 17 miles in length; it is 60 feet in width on the bottom and 120 feet wide on the water line, and it carries 10 feet of water. It terminates in a natural reservoir 3 miles long, $1 / 2$ mile wide and 40 feet deep. From this reservoir extend the secondary canals $\mathrm{A}, \mathrm{B}$, and C , which are 30 feet wide at the bottom and 60 feet at the water line, and these carry 8 feet of water, and their combined length is 150 miles. From these secondary canals the distributing ditches run over the plains, aggregating in the great western section alone a total length of some 800 miles, making a grand total for the western section of 967 miles of main water channels, exclusive of the farmer's laterals

In most other irrigation projects on this contincnt the general plan has been to carry water in a secondary canal or ditch to a point near a considerable area to be irrigated, and then leave the farmers to combine in digging and maintaining ditches, at their own expense, to deliver the water to their several farms; but this company is making the signal departure of carrying the water direct to each individual farm, leaving nothing for the farmer to do but to open up the small furrow laterals on his own lands.

The construction of the canal in the western section with its hundreds of miles of secondary canals and distributing ditches has been a large and expen-

## Headgate of the Main Canal

The total excavation in the main canal of the western section was approximately $2,500,000$ cubic yards; secondary canals $A, B$, and $C$ about $5,000,000$ cubic yards, and in the distributing ditches $750,000 \mathrm{cu}-$ bic yards, making a grand total excavation for the western section of $8,250,000$ cubic yards. At one point it was necessary to cut away the top of a jutting cliff 1,000 feet long, 180 feet wide and 100 feet deep.
Steam shovels and small construction locomotives were used in excavating the large canals and ditches, and in carrying out the earth, and, wherever possible, elevating graders were used, employing steam and horse power. In the construction of banks the greatest care and skill have been shown. The porous surface soil has been stripped off and the harder clay and excavated soils have been used for filling in depressions and building the banks. In building the banks the soil was put on in layers, wetted down, and then packed by rollers to make them strong and water-tight, so there is little danger of breakage or loss from seepage. The soil through which the canals are dug is very hard and clayey, so there is little seepage or erosion.
The intake receives the water, as has been stated, from the Bow River some two miles below Calgary, and when the water was first let on, although only two of the twenty headgates were open, that is, only onetenth part of its possible flow, yet in the very short space of forty-six hours the water had reached the extreme end of the main canal, a distance of seventeen miles, and the difference of level at the intake and the


A Huge Cut on the Main Canal,
end of the canal was only one inch. This was a remarkable showing, and speaks well for the engineer ing skill displayed in locating and constructing the canal.
A large amount of heavy timber has been used in the construction. At the great intake just below Calgary, for the protection of the headgates, a double
that the water is being supplied to the farmer in this great scheme at 50 cents per acre per annum, the duty being 1 cubic foot per second, flowing continuously, for 150 acres, and in selling irrigable land an allowance of 10 per cent of the area is made for the space to be occupied by farm buildings, etc. Demonstration farms have been opened in the western section, and next year

The abundant water supply, the easy slope of the land, the rich and level country through which the great canal runs, with all the possibilities of the most diversified farming, the happy combination of grazing and irrigable lands in the same quarter section, the absolute security of the water right from the crown, and the supply of water needed during the irrigation


Team Excavations on the Main Canal.
row of lieavy piling has been driven along the river's front for several hundred yards. Farther down the main canal a large spillway has been introduced by means of which, in case of needed repair, or for any other cause, the water can be entirely drained off into the Bow River.
At several points on the main and secondary canals the slope of country necessitated the construction of falls or "drops" which carry the water safely to the levels below, without erosion of sides or bed.
will show the wonderful posisibilities of the irrigation of land under this canal in southern Alberta.

In comparison with other irrigation undertakings the project of the Canadian Pacific Company is the largest on this continent and ranks with the great irrigation schemes of the world. I have ridden on donkeys or walked on foot over the rich irrigation strip of old Egypt, but Egypt, from Cairo to the First Cataract of the majestic Nile, is small compared with the great domain contained in this irrigation block.


## Along the Main Canal.

season guaranteed by the Dominion government-all these conditions promise a bright future for irrigation in southern Alberta.
It is filling up rapidly with farmers from the Western and Central States. Ninety-five per cent of the present settlers in this part of the province are Americans. This great irrigation block has room for half a million people and a capacity to feed two millions. The Canadian Pacific Railway has intrusted the development and completion of this great project to Mr. J. S. Dennis, a well-known civil engineer of the Dominion, now assistant to the second vice-president of the road, and his skill and indomitable determination have had much to do with its present realization and its great future possibilities.
A steel-making company in Indiana has given the largest single order for gas engines ever placed by one company. It is for eight gas engines of 3,000 horse-power each, capable of delivering 30,000 cubic feet of free air per minute to the furnaces which produce the blast-furnace gas, which, in its turn, is also used to operate the engines.


A Steam Excavator at Worir.
If the same proportion of mileage and excavation obtains in extending the irrigation system through the central and eastern sections of the block, this scheme will ultimately embrace a total of 2,900 miles of canal, and the excavation of the enormous mass of $24,750,000$ cubic yards of material.
The Bow River has an abundant natural storage, not only in the deep snows and mighty glaciers of the Rockies, but also in the many mountain lakes which pour their overflow into the river. Devil's Lake alone is 12 miles long, $1 / 2$ mile wide, and 40 feet deep, and its great basin is available for storage. In addition there are many other places where the storage of enormous bodies of water can be effected, but the river has in itself a capacity of 6,000 cubic feet per second during the irrigation season.
It may be of special interest to note


Headgate and Piles for Protecting the Banks of the River. ties canadian pacific railway company's irrigation project.

## an electric powderless, smokeless, flashless, and soundless gun.

 by obed c. billman.While but two patents have been issued by the United States Patent Office for electro-magnetic guns, and these within the past two years, yet it appears that scientific men gave this problem their attention a number of years ago.
In 1845, Charles G. Page, of the Columbian (now George Washington) University, Washington, D. C. wrote an article, which was published in the American Journal of Science and Art, vol. 49, page 132, in which he stated:
"Another curious instrument is the galvanic or magnetic gun. Four or more helices arranged successively constitute the barrel of the gun, which is mounted with a stock and breech. The bar slides freely through the helices, and by means of a wire attached to the ends toward the breech of the gun, it makes and breaks the connection with the several helices in succession, and acquires such velocity from the action of the four helices, as to be projected to the $C$ tance of forty or fifty feet."
The primary principle involved in the construction of these guns consists in impelling the projectile by the magnetic action of a solenoid, the sectional coils or helices of which are supplied with current through devices actuated by the projectile itself. In other words, the sections or helices of the solenoid produce an accelerated motion of the projectile by acting successively upon it.
A principle somewhat similar is involved in the construction of electro-magnetic rock drills and dis patch tubes. Patents granted to Marvin, Nos. 361,829 and 368,405 , are instances of the former, and patent No. 259,817, granted to Cheever, is an instance of the latter.
In the electro-magnetic rock drills, the plunger is moved by the action of a sectional solenoid, through the coils of which current is supplied through contacts closed by the plunger itself.
The electro-magnetic dispatch tube consists of a car rier or dispatch tube surrounded by a series of coils or helices, a galvanic battery having one pole permanently connected with one end of the coils or helices by a series of branch wires, the other end of the coils or helices being left open circuited, a traveling carrier provided with circuit-closing devices for completing the circuit between the open ends of the helices, and a conductor connected directly to the other pole of the stationary battery.
$A \mathrm{n}$ advance sheet of Consular Reports, dated February 27 , 1902, contains an account of an electro-mag netic cannon in Sweden, as given in a report by Consul General Bordewich, under date of "Christiania, Janu ary 25,1902 ."
"Prof. Birkeland (who two years ago was sent by the government to northern Norway to study magnetism, the aurora borealis, and cloud formations) is engaged in the construction of a cannon with elec-tro-magnetism as the motive power in place of explosives. A small model of the invention throws projectiles weighing a pound with great force."
A patent was issued to Kristen Birkeland, of Christiania, Norway, for the invention above referred to, March 15, 1904, No. 754, 637 , and this was the first patent issued by the United States Patent Office for an invention of this class.
The application of Birkeland was filed January 2, 1902, and Samuel T. Foster, Jr., a native of this country, residing at Victoria, Tamaulipas, Mexico, having read the account of the Birkeland invention, as referred to in the Consular Report, filed an application for Letters Patent December 10, 1902, but owing to the difference in the construction of the guns disclosed in the two co-pending applications, no interference was declared.
The broad claims originally filed by Mr. Foster were held to be anticipated by the Journal article above referred to, but a patent was finally allowed and issued to him February 6, 1906, for an electric gun, No. 811,913, the second patent issued in the United States for an invention of this class. One of the practical difficulties encountered in the construction of a practical electro-magnetic gun arises from the fact that the modern methods of electrical calculation would indicate that in order to obtain service velocities with service projectiles an enormous number of windings would be required, thus involving the use of a barrel whose length would be prohibitory.

Another difficulty arises from the fact that in order to give the projectile a service velocity, without an enormous number of windings, an abnormally heavy current-that is to say, a current beyond the safe car
rying capacity of the solenoid-is required, and hence the temperature of the solenoid will be raised to a point sufficient to destroy it.

Prof. Birkeland attempts to overcome these difficulties by supplying an abnormally heavy current to a coil and then cutting off the current from the coil before the temperature of the ccil has reached such a point as to injure or destroy it, claiming that the rate of increase of the temperature depends upon a number of factors other than the current.
Mr. Foster says, in the specification of his patent:

the foster electro-magnetic gun.
The projectile is impelled by the magnetic action of a solenoid, the sectional coils of which are supplied with current through devices actuated by the projectile itself.
"All projectiles used in this gun must have magnetic properties, and projectiles of iron or containing large portions of iron are preferable: That projectile having the greatest magnetic permeability is most suitable for this gun." The Foster gun is very simple and comprises a barrel surrounded by a series of coils or helices, a series of openings arranged along the barrel and provided with insulated walls, a series of con-nector-plugs mounted in said openings and normally adapted to be engaged by the projectile, a series of springs mounted in said openings and adapted normally to hold the connector-plugs in contact with the insulated walls, and an electric generator connected with said helices and barrel.
In this way means are provided for energizing and de-energizing the coils or helices in regular sequential order by the projectile completing and breaking their circuits and for automatically keeping the center of their elentro-magnetic field just ahead of the projectile until it has reached the center of the last elec-tro-magnetic field. When the projectile has reached the last electro-magnetic field, means are also provided for opening the battery circuit and releasing the projectile of all further electro-magnetic action of the gun.

## PHOTOGRAPHING A DEVIL FISH-THE CHAMELEON OF THE SEA:

The strange spiderlike creature known as the octopus or devil fish comes of an ancient lineage. Its family tree includes shelled animals which held sway in the Silurian sea millions of years ago. The late
floating, a great white mass, so bulky that the boatman who saw it told me that not only could he not take it aboard, but it was so huge that he could not tow it in. The arms of this specimen he described as being as large as a man's leg, and doubtless this tenarmed devil fish attains a length of one hundred feet and a weight of several tons.
The keeper of the Avalon zoological station, who had an uncanny experience with a large devil fish, or octopus, related the incident to the writer. He said: "I was fishing at the time with several partners out of San Francisco. It was our custom to go out to the banks around the Farallones and try for deep-sea fish. It was a rough place, nearly always blowing half a gale, foggy and dangerous, and often we had to let lines go and run in to lie in the lee of the rocks. One morning I was hauling in the trawl when it stopped coming. I thought I was foul of a rock, so pulled hard, and after a while felt-it give and begin to come up, but very heavy. It's slow work hauling in a trawl, taking off a fish and killing sharks that get hooked, and it was some time before I got what I supposed was a rock. I had just taken a turn about a rowlock with the line, to rest, when it sagged, and looking over I saw a great mottled ball out of which shot a long arm that took hold of the gunwale and held on. We often caught devil fish, and there was a demand for them in the market, so I tried to pull it up; but another arm came up, as big as my own, while another crept over the side near my partner, who started up, shouting that it was coming aboard. I looked over and saw a great red mottled mass hanging to the bottom of the boat; then I reached for a knife-a kind of cleaver-my partner doing the same. The devil fish was caught by several of the trawl hooks, and tried to fasten to the boat to get rid of them. Its arms shot out of the water like fingers, and when I saw one the size of my arm and growing bigger near the base, I didn't wait, but slashed at them right and left, cutting them on the rail. Some of the tentacles near the body looked as big around as my leg, and the whole arm or feeler was nearly twice as long as a man. The arms were probably twelve feet long, and the body two or three times the size of a man's head. The whole mass was so big that we were glad to chor it to pieces as it came aboard, and then to punch it away from the boat with oars and get rid of it; it was too heavy to take aboard, especially in a seaway."
A number of large devil fishes have been taken near Tacoma, and when spread upon the grass are seen to be formidable creatures, with their enormous buttonlike suckers, which combined constitute a power sufficient to drown men in the open water. Monterey has produced a number of large specimens which would terrify strollers along the weed-covered rocks at low tide.
It was my good fortune to have under examination at Avalon, Santa Catalina, at various times, several large living devil fishes and a squid, the latter eight feet in length. The devil fishes were first noticed on a point of rocks at the north end of Avalon Bay. I was lying on a rock watching the movements of some land crabs which kept retreating from the water as the tide rose, when suddenly a crab dashed frantically from the water, and out after it "galloped"-there is no other word for it-a devil fish nearly two feet across. The animal continued the chase a short distance, lifting its tentacles in the air in a sort of overhead motion, then finding the pursuit hopeless it withdrew, with the peculiarly unpleasant writhing, gliding motion characteristic of these animals, and upon reaching the water stationed itself just at the edge, so mimicking the color of the bottom that when I glanced away and looked suddenly back, I could not at once distinguish it. This devil fish had the appearance of a cat watching for mice, and when a crab was seen it would shoot out a long, attenuated tentacle and attempt to seize it. By carefully insinuating my way to the water's edge I quickly grasped the specimen, and after a short struggle tore it from the rocks and secured it. At various times I had from three to five devil fishes in an inclosure, where I could watch them change color and test their strength. In confinement, if the tank bottom was dark, they assumed various tints, generally a dark reddish brown; but the largest one was a tiger-like creature, about three feet across. with a ground of livid white covered with black or dark gray blotches, giving it a truly fiendish appearance, especially as the eyes were conspicuous and appeared to emit lambent gleams. The change of color was marvelous in its rapidity. In a special tank


A Sixty-pound Devil Fish so Powerful That One Man Could Not Tear Its Arms from the Boat.
PHOTOGRAPHING A DEVIL FISH-THE CHAMELEON OF THE SEA.

Prof. Newberry, of Columbia University, referred to a certain Orthosceros titan which may have weighed à ton-a torpedo-shaped creature with a shell twenty feet in length, which doubtless played havoc among the denizens of the abysmal regions of ancient seas. Again, there were others, with nautilus-like shells, as large as a cart wheel; and the most forbidding living animal to-day, the one shrouded by the greatest mystery, is the giant squid, a cousin of the octopus, which lives in deep water, only occasionally being found, as was one recently, off the Southern Californian coast,
in which two of these prisoners were confined they occupied the corners, facing outward, with arms either coiled under or above them. At any offensive movement on my part, presenting my hand under water, the color scheme would change. A blush appeared to
me; but with the tiger, the black and white chameleon, him of the stripes, spots, and blotches, the approach of my hand under water was a menace, and all his movements were essentially cat- or tiger-like. Perhaps you have seen a lynx, wildcat, or mountain lion creep-
danced, floated, or poised, uncertain which way to go, then dropped to its corner again, rendering itself as inconspicuous as possible.
Again I retreated, to allow the photographer to reload with another plate and refocus; the big devil fish


Upper Surface of a Devil Fish Measuring 20 Feet.


Under Surface of the 20-Foot Devil Fish.
pass over the entire surface; and in a large squid I can only compare it to heat lightning, a rapid and continued series of flushing and paling, from deep brick red to gray. It was very evident that the animals differed much in pugnacity. Some did not resent


## Devil Fish About to Leap.

my touching them; others merely threw a tentacle in my direction, while one never touched $\mathrm{m} \in$, but directed its siphon at my hand under water and sent a violent current in that direction, apparently endeavoring to blow my hand away. It was fascinating to observe the "range" this water gun had, and how by seeming intuition the devil fish could direct it at my hand as I slowly moved it about while attempting to attract the animal's attention in an opposite direction. The assumption was almost irresistible that the siphon, that is well shown in the figure, just beneath the eye, had a sense of its own, and could be directed at my hand and made to follow it while the eyes of the octopus were looking in another direction. But the latter are elevated, and doubtless not a move of my hand (a supposititious enemy) which was passed about and around it in the tank was lost to this uncanny chameleon of the sea.
This devil fish, that flushed and danced about in the water, assuming strange postures - now crouching in a corner, now poised midway-was in a sense indifferent to


Holding the Devil Fish to be Photographed.


Ready to Spring.
meantime crouching and spreading itself out, color melting color, tint, and shade over its broad back, directing its siphon stream at its companion. All being ready, I again advanced, pointing my finger at the animal and moving to within a foot of it. I could


Two Fighting Devil Fishes Preparing to Spring at Each 0ther.
see it darken, take on a deep red hue, and then it flung itself bodily at my hand, and endeavored to cover it by a peculiar encompassing motion designed to smother it. A crab or fish is taken in this way, the web being spread over it, shutting the victim in its arms, and the scores of suckers forcing it to the mouth, where the nipping black parrot-like beak is brought into play. But the smothering action is invariable; suggestive and horrifying if we imagine it attempted by an animal thirty feet across. To meet this leap, holding the hand steady, and grasping the octopus, is a nerve-test to a novice. I confess that it was distinctly disagreeable to me, though I have caught and handled many of these animals of various sizes; but I held the devil fish while the photographer took a third picture, showing the duel a second after the contact. The octopus had enveloped my entire hand, and by grasping it firmly I pressed my little finger over its bills, my palm over its eyes, and held it with all my strength.

The animal held me tightly with one tentacle over my thumb, another through my fingers, and bracing itself by throwing out three anchors below, which caught the bottom and two sides of the tank, and three behind.
I now endeavored to complete my pseudo-victory by lifting the octopus, but I could not tear this small animal from the sides. The devil fish held on, pumping a stream of ink at me in its rage. By using my other hand I finally succeeded in prying it off; then I pretended to be caught and tried to release it. But the warlike chameleon of the sea would have none of it.' It threw its tentacles about my hand, pulled it
end of the chamber is formed with a spout adapt ed to guide the cereal into a bag or other receptacle. A gate is provided in the lower end of the receiving hopper, whereby the operator can control the flow of the grain. It will be noted that the bàrs are not promiscuously distributed in the mixing chamber, but that there is a method in their arrangement. They are set in horizontal rows, the bars in one row alternating with those in the next row above or below, and each bar set with its lower face horizontal, so that the other two inclined faces serve as deflectors for the grain. The materials flow downward by their own gravity and, consequently, no power mechanism is required. A patent on this improved mixer has been granted to Mr. P. M. Lyons, of Gueydan, La.

## A NEW METHOD OF PROPELLING A SHIP.

Instead of employing the conventional screw propeller or the paddlewheel, Fénélon Pélissier, of Gonaives, Haiti, has hit upon an entirely different principle, which he has protected by a patent.
Mr. Pélissier uses two endless chains which pass around the hull from bow to stern, and which carry blades. The chains in question run in and out of openings in the hull, fore and aft, and are guided by sprocket wheels. In order to drive
slowly down into the corner, covered it as well as it could, but did not bite me. If my hand had been a crab, fish, or other octopus, it would have been attacked and bitten, but for some reason it did not attempt it; in a word, the animal was perfectly harmless, which I knew; there was only a slight scratch on my hand to tell the story, and this was received when I wrenched it away.
This was a laughable conclusion to the threatening and warlike movements of the octopus. The animal, in point of fact, was a "bluffer," and well calculated to demoralize one not acquainted with its limitations. I know of no animal that has the power, by mere attitudinizing and the assumption of menacing gestures, to inspire the same degree of horror in the spec tator not familiar with it. This was illustrated when I requested an attendant when displaying this octopus to explain to visitors that it was perfectly harmiess, then to enrage it, and ask spectators to take it out of the tank and place it in another, a substantial inducement being offered in one instance. But among the many observers not one could be found who would touch the quivering, color-changing creature poised for its harmless spring; the terror inspired was complete and intense.

## APPARATUS FOR MIXING DIFFERENT GRADES OF RICE.

Pictured in the accompanying engraving is an apparatus for blending different grades of rice or other cereals. The design of the apparatus is such that the blending is effectively accomplished in a very simple manner without the use of power-driven machinery. It comprises essentially a series of feed hoppers for the different grades of cereal, a large receiving hopper into which the feed hoppers empty, and a mixing chamber into which the receiving hopper discharges. The mixing chamber has the form of a lozenge, and the interior is provided with a grid or a series of transversely-extending bars of triangular cross-section, which are so

apparatus for mixing different GRADES OF RICE. form passages for the rice to insure a thorough mixing The series of bars also forms a lozenge shaped figure, but its sides are not parallel with the chamber, so that tapered channels are provided be tween the grid and the chamber which, at the top, assist in crowding therice through the grid and at the bottom flare open to accommodate the flow. The lower
the contents in bucketfuls and convey them to some other basin, whence they are siphoned off into the sewer after the necessary level has been reached This method of cleaning the basins is both laborious and expensive. However, a new form of siphon has recently been invented by Mr. William H. Engelbrecht, of Prince Bay, N. Y., which simplifies the cleaning pro cess. This siphon is shown in the accompanying en graving. It will be observed that the shorter leg, or that portion of the siphon which enters the basin, is formed with a double channel or passage, one channel lying above the other. The upper channel is provided

weans for facilitating the cleansing of street CATCH BASINS
with a funnel mouth opening upward. In use the contents of the basin are dipped up and poured into this funnel, whence they flow down the longer leg of the siphon to the sewer main. The upper passage is so designed as to form a trap or water seal, so that after cleaning out the basin a quantity of clean water is emptied into the funnel, to clear the trap of foul liquid or sediment, and provide an effective seal against the escape of sewer gas through the siphon into the basin.

## SOUND DEFLECTOR FOR PIANOS.

t does seem rather odd that the source of music in a piano should be completely boxed up in a case, so that the sound waves must first penetrate the case before they can reach our ears. To be sure, some pianos are provided with a swinging front, and a hinged lid at the top, which may be opened to pre vent complete muffling of the sound; but the sound is deflected downward by the hinged front, or passes directly up to the ceiling when the top of the case is open. In the accompanying engraving we illustrate a device which may be placed over the open top of the piano to deflect the sound waves issuing therefrom, and direct them to the audience in the room or concert hall. The deflector is a very simple device of light construction, comprising two end boards connected by a curved back of such form as properly to direct the sound into the room. The end boards are formed with cushioned flanges adapted to rest on the side walls of the piano case, while the curved back is formed with cushioned extension, which fits between the side wall and thus prevents lateral displacement. In consequence, the deflector does not need to be fastened in place, but may be readily set in position or removed without operating any fastening means. By its use the full volume of sound passes in concentrated form into the room without being diffused. A patent on this sound deflector has recently been secured by Mr. T. W. Freeborne, of 228 Spring Str zet, Newport, R. I.


SOUND DEFLECTOR FOR PIANOS.

## RECENTLY PATENTED INVENTIONS.

## Pertaining to Apparel.

CUFF AND SLEEVE PROTECTOR.-C. H. Overman, Marion, Ind. This device is formed
of wire suitably covered, and is designed to of wire suitably covered, and is designed to
be slipped over the wrist of the person using it, and is provided with means for engaging the cuff or sleeve and holding it in an elevated position while the hands are being used
in any manner that would tend to soil or wet in any man
the sleeves.
animal head.-b. Cohen, New York, N Y. This patentee provides an improved head,
over which the skin is drawn in fur articles over which the skin is drawn in fur articles.
It is made of soft rubber and is arranged to properly display the head and still render th same flexible, to allow of conveniently plac-
ing the head-filling in position in the skin, ing the head-filling in position in to draw the skin into place to give th proper shape to the head, and to provide part of the garment of which the head is part.
PNEUMATIC HEEL CUSHION.-W.
Gordon, Deal, N. J. This attachment, which is to be worn in the interior of the shoe, a
the heel, is constructed with a novel arrange ment for affording a pneumatic cushion; and is provided with a resilient frame tending to
support the cushion above the heel so that the action of walking serves to force out the air and afford ventilation to the interior
the shoe. SKIRT MARKER.-A. Waterman, New
York, N. Y. The purpose of the invention is to provide a skirt marker which can be at
tached to any garment form having a stan tached to dny garment form having a stanskirt placed on the form as to length and
evenness of length, with the same ease and evenness of length, with the same ease and
accuracy as if the skirt were hung upon a person.
SHOE.-T. Skerrett, Spokane, Wash. For
the use of pole-climbers, shinglers, miners and the use of pole-climbers, shinglers, miners and
others, Mr. Skerrett has provided a shoe others, Mr. Skerrett has provided a shoe
which has a triple strength for the instep portion from the rear to the toe, and a double quarter and a half double vamp, and a double
toe section. The shoe is thus strengthened at toe section. The shoe is thus strengthened at
the parts which are most liable to wear in the part
COAT LAPEL AND COLLAR REGULATOR -W. H. Cling, Charleston, S. C. The in vention provides a device for holding the front
breadths of coats and vests distended or
stretched in such a manner as to prevent stretched in such a manner as to prevent
wrinkling or sagging. For this purpose a thin strip of steel is used which may be detachably
applied, and whereby the lapels are prevented applied, and whereby the lapels are prevented
from rolling back at the lower end.

## Of Interest to Farmers.

RIDING CULTIVATOR.-J. A. Burt, Gunnison, Miss. This patentee contemplates im
proving cultivators in several particulars, in cluding the means for elevating the shovel cluding the means for elevating the shovel shovels for acting at the desired depth, and for varying the distance between the shovels.
Provision is made also for the more easy Provision is made also for the more eas,
manipulation of the cultivator in turning, and for more equally distributing the pull.
PLOW.-T. B. Hansford, Stephens, Ga.
This improvement relates to the means for This improvement relates to the means for
adjusting the plow blades to run deep or shalat the handles. The plow beam drops at the rear end, and a brace extends from the higher portion of the beam to the handles. The raising device includes a standard fulcrumed lever ext
CORN HARVESTER AND HUSKER.-T. A. and J. G. Overby, Mellette, South Dakota.
One of the main objects of the machine deOne of the main objects of the machine de-
signed by these patentees is to so construct signed by these patentees is to so construc
the same that the corn will be reached and brought into the mechanism of the machine, and the other operations performed, without
the necessity of exercising great care on the the necessity of exercising great care on the
part of the operator. The snapping devices have improved means for mounting the same in the frame in a manner to enable them to similarly the husking rolls are supported in separate parts of the frame, providing a space
into which any uprooted stalks may pass, in a way to prevent clogging. In various other respects the applicants design to mak
mechanism more practical and durable.
INCUBATOR.-C. S. Newsom, Athens, Ohio
This patentee has devised an incubator rathe This patentee has devised an incubator rather
out of the conventional form. An important out of the conventional form. An important
feature is a rotatable egg-holding tray comfeature is a rotatable egg-holding tray com-
prising a series of wire cylinders, combined
water-holders and heaters being arranged on water-holders and heaters being arranged on
opposite sides, and these with various other details being designed to have increased prac tical importance in hatching, protecting, and ng for the chicks.
GRAIN-F'EED.-C. G. Haegert, Hawley, of this patent is designed to take grain eithe headed or otherwise, from a stack and feed it into the threshing machine. The construction is
light and strong; is portable, and is designed to be drawn between two stacks, to operate simultaneously on both. Means are provided
for independently adjusting the rakes employed at the sides of the machine, to accom
vision is made for automatically imparting the
necessary movements to the rakes to effect the necessary movements to the rakes
alternate gathering and discharge.
LOADING apparatus.-Alcee Landry, Mark, La. This patentee has produced an apparatus particularly adapted for loading sugar cane from the field onto wagons, so that the cane may be handled very expeditiously and with a swinging boom on the vehicle, and a grapple operated by a special arrangement of drums with their ropes and pulleys for effecting the different operations quickly and with precision. At the side of the vehicle opposite mounted, consisting of a pole with a weight at the top which may be raised and lowered
to counterbalance the load and prevent the tilting of the vehicle
INCUBATOR.-G. H. Lee, Omaha, Neb. The latest invention of this patentee is inended as a further improvement on the in cubators already patented by him, the particular improvements in the present case relating and the the egg-trays and features of the structure, the gg-tray devices being designed to facilitate the breaking of the shell by the weight of the chick, and for facilitating the separation of the chicks from the unhatched eggs, the floor a space below the tray constituting a nursery with a reduced heat.
harrow.-G. Metcalfe, Wilczinski, Miss. The purpose of the invention is to provide a
harrow primarily intended for the preparation arrow primarily intended for the preparation
of soil in cotton culture, in such flat and amp sections of the country as the Yazoo nd Mississippi delta, and which will combine whereby to remove from bedded lands all grass, weeds, and clods, and leave a smooth surface for planting. This is a result which
cannot be accomplished with the ordinary har ow or cultivator.
indicator.-C. Versteeg, Ashton, S. Dak. The indicator comprises an open electric circuit including a signal to be operated by the
contact of the terminals of the circuit, the contact of the terminals of the circuit, the latter being arranged within the bin in a posi-
tion to be moved into contact by the grain when it reaches a predetermined depth. Means re also provided for preventing the grain preventing their engagement.

## of General Interest

DEVICE FOR USE IN TRANSFERRING CE CREAM CANS.-JACob Renner, Rockwell City, Iowa. In order to provide a pracice cream cans from their freezing tubs without disturbing the ice, and transferring the cans as desired in making and handling icecream on a large scale, the patentee arranges a cylindrical lifter comprising two pivotally
connected handled sections adapted to be passconnected handled sections adapted to be pass-
ed downward on the outside of the can, and downward on the outside of the can,
to engage the can so as to lift the latter. COOKING STOVE.-E. C. Cole, Chicago, 11. The oven of the stove illustrated in this sides, top and bottom, and there is an ar rangement of deflector, and there is which are designed to be given certain bends by the manufacturer of the stove, such as will produce the ecessary circulation through the flues,
ends of the plates being varied according to the fuel usually employed in the district in which the stove is intended to be used.
FLEXIBLE TUBing.-G. M. Anderson, Hyde Park, Mass. This invention relates to
flexible metal tubing and couplings for the flexible metal tubing and couplings for the
same. The tube is made up of longer and shorter sections, the opposing ends of the ections being respectively concaved and conrexed so as to rock in any direction, and a
spiral spring is arranged either on the interior or exterior of the tubing, coupling the sections together, the coils of wire interlocking with certain of
necessary stability
Spoon holder.-Louis J. R. Rivet, New Orleans, La. A unique, practical spoon holder mentioned inventor, and comprises a piece of metal bent to form a clamp into which the
spoon handle may be slipped, and a spur on spoon handle may be slipped, and a spur on
the under side of the holder which may be inserted into the cork of a medicine bottle, so that the spoon is
top of the bottle.
GLASS WASHER AND SCOURER.-A. W BEERBOWER, Bryan, Ohio. This invention is
mainly intended for use in hotels and restauants. It is pro handle and arranged to act on both the interior and exterior of the glasses. A compartscouring powder, with a cylindrical feeder for delivering the proper amount as required.
POCKET-LIGHTER.-W. C. and C. F. Mac
Donald, Rock Island, Ill. It is the object of his invention to provide an improved pocke lighter having a magazine containing fulmin-
ating pellets adapted to be successively and ating pellets adapted to be successively and
safely ejected from a magazine into a socket at the outside of the casing and to be ignited therein for lighting purposes.

APPARATUS FOR PURIFYING NATURAL aparatus provides for purifying, by means of
suitable chemicals, water that contains com-
pounds of calcium, magnesium, 'aluminium, pounds of calcium, magnesium, aluminium,
iron, and other impurities. In the case of water containing free acid, or alkali, a neutral izing chemical is used. Mechanically-sus-
pended matter and certain dissolved objects are to some extent c

## pitated impurities.

UMBRELLA-RIB AND STRETCHER CON Nection Therefor.-P. V. Brady, New york, N. Y. The invention is particularly adapted for paragon umbrella ribs, and it
purpose is to provide a lap which can be stamped from a single piece of metal, and
clamped to the rib. The lap is partly conclamped to the rib. The lap is partly concealed by the rib and is provided with
knuckle within the groove of the rib to whic knuckle within the groove of the r
the stretcher is pivotally attached.
SAFETY DEVICE FOR ELEVATORS.-W C. Tench, Lynn, Pa. The invention has ref rence more especially to safety devices fo elevators and provides means for preventing within the elevator shaft either from over winding of the hoisting cable for the cage, or from other causes.
artificial denture.-P. b. Lesemann, ashvile, The object of the invention is to provide nove
means for securing an artificial tooth to mouth-plate. It enables the ready substitution of a new for a broken tooth on a vulcanized plate without revulcanizing the plate.
RESCUE BUOY.-Jerusha C. Quarterman Titusville, Fla. This buoy is especially adapted for use in marine life saving service, and is
so constructed that a maximum of hand-holes are provided, permitting a person grasping the buoy at any point of its area to quickly
instinctively secure a firm grip thereon.

> instinctively secure a firm grip thereon. DUMPING AND ELEVATING APPA DUUMPING AND ELEVATING APPARA
TES. J. MaUGEr, Minier, IIl. Mr. Mauger's invention is an improvement in apparatus fo cles from a wagon or cart into a conveyor by which it is delivered into a permanent storage tation. The present invention covers various additions to the original invention which was recently patented by Mr. Mauger.
ROTARY PUMP.-H. R. Comly, San Diego, Cal. The pump belongs to that class which
comprise a cylinder, a cylindrical piston ar comprise a cylinder, a cylindrical piston ar
ranged eccentrically therein, and a slidable ranged eccentrically therein, and a slidable
abutment or cut-off which reciprocates corresponding to the rotation of the piston, where by fluid is taken in and ejected from
cylinder at each rotation of the piston.
priming Device.-J. W. Graeme and r W. McNelly, Navy Department, Washington D. C. The invention has for its object to
provide recording mechanism in connection with an improved primer, whereby a record is made of when the primer has been fired. The invention also comprises me
the efficiency of the primer.
CLAMP.-E. R. Ericison, New York, N. Y The clamp forming the subject of this patent is intended for use by wood-workers and other
artisans. The improvements comprise clutches artisans. The improvements comprise clutches
arranged in connection with one of the jaws of the clamp, to function as the jaw is brough into engagement with the work, the clutches
acting automatically to prevent backward novement of the jaw
MATCH BOX.-W. P. Locke, Canton, Ohio, has obtained a patent on a novelty in the in which a single match is delivered at a time. The present inventor utilizes the tray of the ordinary match box, and provides on a the box tray and engage the same by spring arms, the plate having an opening of such a allow the removal of one at a time. When allow the removal of one at a time. When
not in use, the plate may be folded downward not in use, the pla
against the base.

## Hardware

RULE.-H. D. Hagerman, Houlton, Me. The nvention consists of an ordinary two-foot rule
having the outer hinged members grooved on their opposite edges with a metal scabbard secured therein to one of the members. The is held from accidental displacement.
CLAMP.-E. R. Erickson, New York, N. Y. This clamp is of simple construction and is so designed that the distance between the clamping faces may be quickly and readily adjusted
to receive objects of different thicknesses. The invention is specially useful for the purposes of a joiner or cabinet-maker to hold members
which are being glued together.

## Heating and Lighting.

PROCESS AND APPARATUS FOR GENERATING A COMBUSTIBLE GAS FROM Hornsby, N. S. W., Australia. The apparatus is adapted for utilizing the residuum of
petroleum and other liquids of like nature to roduce a highly combustible gas. It consists in simultaneously introducing oil and steam mixing the fluids after which the resultant mixture is introduced
or retort and burned.
apparatis for generating acetYLENE GAS.-A. Rosenberg, 259 High Hol an, London, England. The invention relates
gases by the reaction occurring progressively ermitted liquid and solid reagent which are one another. The vessel in which the solid reagent is transported or stored is designed to serve as a generator for the
is immersed in the liquid reagent.
oill-burner.-S. M. Morrison, Bakersfield, Cal. This improved burner is adapted or use in a small stove or in a large furnace plete and a smokeless fire produced.
drade of distillate or crude oil is used for the uel and means are provided for removing the waste product. Where crude oil is used the sphalt drawn off, if preserved, is of more alue than oil in its crude state.
REGULATOR FOR GAS BURNERS.-A. A. Pratt, New York, N. Y. This invention reof mainly to incandescent burners, the object
of the improvement being to so construct the urner that it forms a regulator which serves to ontrol the amount of gas passing from the supo as to form an inflammable mixture of the as to form an inflammable mixture of the he quality and pressure of the gas supply. We ote the devices for carrying out the purpose re quite simple in form and arrangement. PIPE FITTING FOR HOT WATER HEATing SYstems.-John O'Neill, New York, N. Y. The fitting forming the subject matter of this patent is intended mainly for use in a type of hot water heating system designed by
the same inventor, the fitting being intended more particularly for embodiment in a threeipe heating system. It results in forming the ecessary connections by a reduced number of the heating medium through the nipes and radiators.

Household Utilities.
WEATHER-STRIP.-T. J. Johnson, Noran, Okla. Ty. The weather-strip is hinged to the door in such a manner that when the door by a contact pin on the door jamb. Means re also provided for moving the weatherstrip endwise, thereby permitting the use of a slightly longer weather-strip than would otherwise be practicable, and forming a closer fit or joint.

## Machines and Mechanical Device

PASTEURIZING APPARATUS. - H. E. Weber, Canton, Ohio. The milk is first and then by one or several successive stages quickly reduced to a considerably lower temperature. In order that the greatest efficiency
be obtained the change in temperature is accomplished as nearly instantaneously as poss complished as nearly instantaneously as possividually subjected to the heating and cooling treatment.
GARMENT-PRESSING MACHINE.-J. B. Replogle, Chicago, Ill. The machine is so designed as to enable the material of a garment to be subjected to a pressure by a pressing iron, the position of which is readily con
trolled. The construction is such that the trolled. The construction is such that the
machine may be driven by power as well as machine may be driven by power as well
manual force in applying the pressure.
GEARING.-J. K. Koons, Montgomery, Pa peculiar construction of transmission mech nism has been provided by Mr. Koons where
by a sharper graduation of the ratio beby a sharper graduation of the ratio be-
tween the differential gears is permitted. At the same time the construction provides a cer between a countershaft and the driving shaft BRICK OR BLOCK MACHINE.-D. F. MCDonald, Lake Butler, Fla. The patent granted to this inventor discloses a new form of mold for molding bricks or building blocks out of cement composition. The mold is of very sim-
ple form and is intended to have special use fulness in isolated places or localities where large and costly machines are not available In general form the apparatus includes tw anded bars or levers arranged on a rectangu forming one side and one end of the mold, so that the mold is completed by the two secSLU So. Dak. The subject of this patent relates o. linotype machines. The inventor has in view to enable an operator, in setting up matter in which a plurality of slugs are used to form a single line, to determine readily at what point in the line a slug is being cast, rienced with operators in keeping in mind the rienced with operators in keeping in mind the
precise order of the slug on which they may precise ord
be working.
dough-rolling machine.-William Frank, Guttenberg, N. J., discloses in a reintended for forming the dough into substan tially spherical shape, the special merits claim ed for the machine being its simplicity, the re sulting quickness of the operations, and the feasibility of separating the sections of the machine for cleaning. In general, there is concave wheel co-acting with a grooved casing so that a circular space is provided into which the dough is fed by a funnel, and from which tion of the whee
MACHINE FOR REFINING FLOUR.-C. L
signed by this inventor relates to the forcin
of nitric oxid or other gas mixed with ai through wheat flour and other products in bleaching and refining the flour, an important object being to effect a uniformity in the generation of the gas. An examination of the
specification and drawing of the patent is specification and drawing of the patent is
necessary to an appreciation of the mechanism and its operation.
WASHERS.-John R. Hughes, Chama New Mex., has patented an improvement in
the washers employed in connection with cot the washers employed in connection with cot
ter-pins of various machines. The washer is ter-pins of various machines. The washer is sides of its opening or eye, integral portions sides of its opening or eye, integral portions
of a shape to constitute offsets and receive the cotter-pin.
GAGE-George Arnold, Chicago, Ill. unique gage forms the subject of a patent granted to this inventor, the device being ap-
plicable to augers and like boring tools, and so plicable to augers and like boring tools, and so
formed that it may be quickly secured in place on the bit at the desired distance from the point of the auger so as to de
depth to which the hole will be bored.
Crushing rolls.-Jose Pelaez Rodri GUeZ, Caibarien, Cuba. This patentee primar ily intends his improvement to be embodied in
the rolls for crushing sugar cane. The imthe rolls for crushing sugar cane. The im-
provement is characterized by a special form provement is characterized by a special form
and disposition of teeth on the surface of one of the rolls, the merits claimed being that a more complete laceration of the cane is effected, so as to enable a
of the juice to be obtained
improved rod Pácking.-G. Stewart and G. F. Stewart, New York, N. Y. These
inventors have devised a modification of the metallic packing of piston rods. The packing is of the type employing split rings, and the arrangement of retaining and adjusting de-
vices is such as to cause frictional contact bevices is such as to cause frictional contact between the rod and the packing rings when the
piston is on the outward stroke, so as to force piston is on the outward stroke, so as to force the packing rings tightly together and in close
contact with an encircling sleeve, the frictional contact releasing on the return stroke.

## Prime Movers and Their Accessories.

 transmission-gear. - J. Chalmers, Bath, Maine. The improvement refers to ameans for transmitting rotary motion reversely and at various speeds. It is useful, particu larly in connection with internal-combustion engines employed for driving boats and vehicles. Novel features reside in the construction
and organization of the devices for connecting the loose gear at will with the transmitting ment of the reverse transmission, on the gen ment of the reverse transmission, on the gen case, and various others of importance.
lubricator.-J. J. Slagel, Fairbury, Ill -Type usedention relates to a lubricator of that larly steam engines, and embodying a pump for forcing the lubricant through a sight-feed device and thence into the steam pipe or other
part of the engine, so that the oil passing into the engine with the steam lubricates the
COMBINED VALVE-STEM CLAMP AND LUBRICATOR.-J. C. Williamson and W. D.
Barker, Tallahassee, Fla. The purpose of the invention is to provide a combined valve-stem
clamp and lubricator arranged to lubricate the valve-stem outside and immediately adjacen to the stuffing box, and to permit the engineer to quickly and securely lock the valve-stem, of a breakdown of the corresponding engine so as to allow running of the locomotive by the use of the other engine alone

## Railways and Their Accessories.

 ear-COUPLING.-H. V. Rogers, Tiosa, Ind The object of this inventor is to providenovel form of coupling that will not only auto matically couple when two cars are brought together, but will uncouple should an accident
occur-such, for instance, as the derailing of occur-such, for instance, as the derailing of
a car, tipping over of a car, or a car breaking down at the center
RAILWAY-SWITCH. - C. E. McDonald Butte, Mont. In the present patent the in
vention has reference to railway switches; and the object of the improvement is the producit will enable a car on the main track to pass from the main track in either direction.
AIR-BRAKE ATTACHMENT.-J. B. O'Don NELL, Freeland, Pa. The object in this case is to provide means by which the engineer on
a train equipped with the automatic air-brake system may be given full control of the triple
exhausts independently of and notwithstanding exhausts independently of and notwithstanding
the usual retaining-valves. This is attained by the usual retaining-valves. This is attained by
fitting to the triple exhaust a valve closing by fitting to the triple exhaust a valve closing by
the brake-cylinder pressure and commanding a the brake-cylinder pressure and commanding
vent to the atmosphere, which valve is unde the control of the engineer through the medium train-line pressure.
TUSAR, Forest City MOVING CARS.-J. D vented a device which may be attached $t$ heavy cars to move them a short distance. The invention is particularly applicable to
mining cars to move them up a steep grade mining cars to move them up a steep grade
The device may be operated by one man with out any dainger to the operator.
Houston, Texas, The invention is herrington
ment in switches of the type adapted to be
operated automatically by the wheels of the cars or engines, thereby dispensing to a con iderable extent with the work of a switchlihood of an accident caused by negligence in
lime same time lessening the likeleaving the switch open.
Sander.-G. E. Cummins and h. S. Ferduson, Cherokee, Kans. The invention relates particularly to a sander for locomotives. In
sanding devices operated by compressed air the sand tends to clog the air passages and interfere with the proper operation of the
device. It is the object of the present inven tion to overcome this disadvantage.
RAIL-JOINT.-T. Crane, East Branch, and . M. Wheeler, Fishs Eddy, N. Y. The object of the present invention is to produce a rail-
oint of simple construction which may be quickly applied and which will operate to
hold the abutting ends of the rails securely hold the abutting ends of the rails securely
without necessitating the employment of bolts without ne
and nuts.

Pertaining to Recreation.
PLACE AND POSITION INDICATOR.-F H. Schauffler, New York, N. Y. One pur-
pose here is to provide a device whereby to pose here is to provide a device whereby to
indicate place and position by lot or design for various persons at tables or at other places where games of cards and other games are played, whether independently or as partners, in which latter event partners have their places and positions decided by lot or design,
and, further, to provide a device applicable to ny occasion to to be selected by participants.

## Pertaining to Vehicles.

LUBRICATOR.-S. J. Welter and G. C. Welter, Roswell, New Mex. The invention pertains to a device for lubricating wagon-
ales successfully and doing away with the necessity of taking the wheel from the axle when the oil is applied. On account of the inconvenience of taking wheels from axles it
is well known that they are frequently left on so long as to become dry and to burn out the bearings. This device can be filled with oil while a wheel is on the axle.
DUMPING-CART.-J. Guiry, New York, N. gether with a sover and means for raising the ame to enable the cart to be dumped when esired. Means are also used for sustaining the cover of the cart in its raised position
and for preventing the cover from being carried or thrown beyond a
forwardly of the structure.
STREET-CLEANER'S TRUCK. - J. Rehm and T. Von Gerfchten, New York, N. Y. The which will afford means for carrying a recepacle, such as a can, conveniently, which will facilitate the raising and dumping of the refuse from the street into the receptacle, and which will facilitate the removal and replacing of the eceptacle upon the truck
Note.-Copies of any of these patents will bearnished by Munn \& Co. for ten cents each. Please state the name of the patentee, title
the invention, and date of this paper.

Business and Personal WUants.
READ 'THIS COLUMN CAREFULLYY-You will ind inquiries for certain classes of articles numbered
in consecutive order. If you manufacture these goods
write us at once and we will send vou the name and address of the party desiring the information. In
every case it is necessary to give the
number of the inquiry.

Marine Iron Works. Chicago. Catalogue free.
Inquiry No. 8412.- W a nt e d a a light-running
pump, which will pump about a half-inch stream of Inquiry No. 8412.- W a n
pump, which will pump about
water; force pump preferred.

Inquiry No. 8413 . - Wanted, machinery for use in
the manufacture of carbonic acid gas.
"U. S." Metal Polish. Indianap.olis. Samples free. Inquiry No. 8114. - W an t e d , granulated iron
oride and aluminium, suitable for the Thermit process
of welding.
Handle \& Spoke Mchy. Ober Mfg. Co., 10 Bell St., in Falls, 0.
Inquiry No. 8415 . - Wanted, makers of elastic
rope or cord simiar to that used on the W hitly exer-
cising machines.
Sawmill machinery and outfits manufactured by the Inquiry No. 8416.-Wanted, an automatic ma-
chine or electric pencii or needde for writing on glass-
ware and engraving on pearl or glass novelties. I sell patents. To buy, or baving one to sell, write
Chas. A. Scott, 719 Mutual Life Building, Buffalo, N. Y. Inquiry No. 8417 .- W anted, addresses and cata-
logues of manatacturers of machinery for making rub-
ber horse-shoes. The celebrated "Hornsby-A kroyd" safety oil engine. oerting gas engine and producer. Ice machines. Built Inquiry No. 8418.-Wan ed addresses of schnols
of autombinile engineers in ciicies in the vicinity of Fort
Wayne, Ind.
Manufacturers of patent articles, dies, metal machine work and special size washers. Quadriga Inquiry No. 8419 . - W anted manufacturers of $p y$ -
roline. Inquiry No. 8420.-Wanted o.
or handling nipht soils and sewage.
Inquiry No. S421. - Wanted, a
Inquirv No. $8421-$ Wanted, a machine for print-
ing metal signs with paint.
Inquiry No. 8422.-Wanted, cardboard disks, or
Inquity No. 8423.- Wanted, machinery for mak.
ing starch from
alcohol from potatotos.

ints to correspondents

## Names and Address must accompany all letters o no attention will be paid thereto. This is fo our information and not for publication. <br> References to former articles or answers should give date of paper and page or number of question. Inquiries not ansered in reasonable time should be repeated; correspondents will bear in mind that <br>  the same. secial Written Information on matters of personal rather than general interest cannot be expected without remuneration. Scientific American Supplements referred to may b had at the office. Prie 10 cents each. Books referred to promptly supplied on receipt of | price. |
| :--- |
| $\begin{array}{c}\text { Minerals. sent for examination should be distinctly } \\ \text { marked or labeled. }\end{array}$ |

$\underset{\text { (10177) }}{ }$ P. H. K. writes: Is ice formed from sea water salt or fresh? A
claims that it is salt. B claims that it is impossible to have salted ice, as in the process
of freezing the salt is eliminated. Who is right, A or B? A. When aqueous solution freeze, the solids in solution tend to separat pure or nearly so. It would not be easy to
form a block of is sometimes expressed by saying that wate freezes itself pure, which is not a very correct manner of stating what takes place. The
water freezes molecule by molecule, and the water freezes molecule by molecule, and the
solid in solution is separated from its solvent, the unfrozen portion of the solution becoming finally a saturated solution. B has the better
(10178) H. L. S. says: Will you please inform me how to connect up an electric bathtub? A. If the tub is of metal, connect one
of the electrodes to the metal, while the other . one el
( 10179 M. M. asks: 1. If lightning strikes in a body of water where a man is
swimming, will he feel it if it strikes within swimming, will he feel it if it strikes within
a hundred yards of him? A. We do not know a hundred yards of him? A. We do not know
any reason why a person should be affected by lightning striking the water in which he is swimming. The earth is at zero potential and is of infinite capacity, from which it follows that no amount of electricity can raise the
electrification of the earth so that a man could electrification of the earth so that a man could
be shocked by it when he is immersed in it. be shocked by it when he is immersed in it.
The case is the same as that of a man buried in the ground or in a cellar under the ground. No lightning stroke can harm him in either of
these positions. Of course a man's head projecting above the water might be struck, but this is not the condition which you suppose 2. Which will break first, a rope 5 feet long or a rope 100 feet long, if it has the same
strength all over the rope and the same strength pulling it? A. If two ropes, one 5 feet long and the other 100 feet long, are
pulled equally, the ropes being supported a pulled equally, the ropes being supported at
the ends only, the longer rope will break first, since its weight is greater than that of
the shorter rope, and is added to the pull the shorter rope, and is added to the pull
upon it. If the ropes were lying on the difference in length would make any difference in breaking strength, although we are awar that many hold the opposite opinion.
(10180) J. W. H. asks: Is there any difference in the strength of a magnet with
a $1 / 4$-inch core and one with a $1 / 8$-inch core if $1 / 4$-inch core and one with a $1 / 8$-inch core if
both are wound with the same amount wire? Would it make any difference to the strength of a magnet having a $1 / 4$-inch core to have the core thinned down to $1 / 8$ inch at the
bending point? The reason for doing this is to make it easier to bend after the magnet i bound. A. The ease with which lines of mag netic force can pass through the core of an
electromagnet is proportional to the sectional electromagnet is proportional to the sectional
area of the core. For this reason a core $1 / 4$ nch in diameter will transmit four times a all other conditions were the same. We should not advise the winding of an electromagne and bending the core after the winding. It is will slide over the iron core and put them in place after the core has been bent into its inal shape.
(10181) N. R. R. asks: Will you please let me know whether natural ice is
colder than manufactured ice or not? The lat ter is made at a temperature of 20 degrees
above zero, and natural ice undergoes a temperature sometimes many degrees colder. Doe it retain this greater cold? A. All ice, natural
or artificial, in any place below the freezing point will have the temperature of that place in any place above the freezing point it will have the temperature of the freezing poin freezing point. It cannot be heated above the freezing point, under ordinary circumstances. to the temperature of the air, be it zero o below, and becomes warmer as the temperature
rises till its melting point is reached. Then rises till its melting point is reached. Then
it cannot be made hotter. It changes its it cannot be made hotter. It changes its
condition to the liquid form.

## NEW BOOKS, ETC

Symmetrical Masonry Arches. By Malverd A. Howe, M.Am.Soc.C.E. New
York: John Wiley \& Sons, 1906. York: John Wiley \& Sons
8vo.; pp. 170 . Price, $\$ 2.50$.
The author presents in simple form, with consideration for the theoretical aspects
of the question, the methods to be employed the designing of masonry arches according to the elastic theory. As masonry arches are constructed of materials and under conditions which are more or less uncertain in character,
it has been found that rigid and comprehenit has been found that rigid and comprehen-
sive formulas are hardly necessary, and consive formulas are hardly necessary, and con-
sequently those presented in this book are sequently those presented in this book are
approximate, but nevertheless of sufficient acuracy for the purpose. Many examples are ven with each step of the solution in detail. student or the engineer who has not the requisite time to review the theory of arches thoroughly.
Designs for Small Dynamos and Motors. By Cecil P. Poole. New York: Mc8vo.; pp. 186. Price, $\$ 2$.
The text of this book comprises a number of articles which have previously appeared in included in Electrician, and pesigs, by the same uthor. While Mr. Poole has avoided theoretical calculations and reasonings, as far as dge of a certain amount of practical knowldge of the subject will be necessary for the tage; but the descriptions will be intelligible , the construction of such machines as the
book covers. Each chapter comprises one deign and gives the actual details of design in the form of working directions, avoiding the underlying principles and the reasons for the arious steps. This is a rather unfortunate eature of the book, and greatly decreases its ducational value. The working drawings are ith, and whil be clear to anyone familiar
with ordinary shop practice.
omplete Examination Questions and Answers for Marine and Stationary Engineers. By Calvin F. Swingle,
M.E. Chicago: Frederick J. Drake M.E. Chicago: Frederick J. Drake
\& Co., 1906. 32mo.; pp. 367. Price, $\$ 1.50$.
The past few decades have witnessed such team engineering depent in the science of team engineering that our present day sees
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INDEX OF INVENTIONS For which Letters Patent of the United States were Issued or the Week Ending October 9, 1906.
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| 833,034 |
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