# (RAR <br> ค <br> [Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1908, by Mann \& Co.] 




The Machine Takes the Coke from the Face of the Pile and Delivers It Withont Breaking the Fuel.

# SCIENTIFIC AMERICAN <br> established 1845 

MUNN \& CO.
Editors and Proprietors
Published Weokly at
No. 361 Broadway, New York
CHARLES ALLEN MUNN, President
361 Broadway, New York
frederick converse beach, sec'y and treas.
361 Broadway, Now York
terms to subscribers.
 the Suientific american publications.
Scientific American (established 1845)
Scientific American
Scientific American Supplement (established 18\%6).................$_{300}^{8.00}$ a.
American Homes and Gardens
American Homes and Gardens
The combined subscription rates and rates to
ing Canada, will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN \& CO., 361 Broadway, New York.

## NEW YORK, SATURDAY, JULY 18, 1908.

The Editor is always glad to receive for examination illustrated artucles on subjects of timely interest. If the photographs are sharp, the articles short, and the facts authentic, the contributions will receive spec
tention. Accepted articles will be paid for at regular space rates.
the scientific american aeronautical trophy. Elsewhere in the present issue will be found an account of the recent competition for the Scientific American aeronautical trophy. The successful flight made by Mr. Glenn H. Curtiss was the culmination of carefully planned and patiently and intelligently carried out efforts for the winning of this trophy, by a combination of inventors known as the Aerial Experiment Association. Its moving spirit and principal backer is Dr. Graham Bell, whose elaborate experiments in aeronautics, carried on for the past few years on his private estate, are well known in the aeronautical world. Not without the inventor's due share of discouragement, and not until the expenditure had been made of much time and money, was the machine which achieved success finally produced; for this was the third aeroplane built by the association, the first two having failed to give altogether satisfactory results; although sufficient was achieved in the earlier trials to give confidence that the present machine would be equal to the terms of the competition.
The success of Mr. Curtiss and his associates has aiready awakened widespread interest, and has led to the construction of several new aeroplanes, which, if all goes well, will be entered in the next contest for the trophy. This will probably take place about the middle of September next. Now that another successful aeroplane besides that of the Wright brothers has been developed in this country, and in view of the rapid progress which is being made in aeronautics, the Contest Committee of the Aero Club has decided that the rules governing the competition should be sufficiently stiffened to insure that the winning machine will represent the top notch in the present-day science and art of mechanical flight. It is probable that the prime requisites called for under the new rules will be high speed and automatic stability.

## THE FIRST $25-\mathrm{KNOT}$ LINER.

The "Lusitania," by making her last passage from Queenstown to New York in 4 days, 19 hours, and 36 minutes at an average speed of 25.01 knots, has the distinction of being the first 25 -knot transatlantic liner. On her first day out she made a record run of 643 knots, at an average speed of 25.38 knots. It has taken twenty years to raise the speed frcm 20 to 25 knots; and the question naturally arises as to how many years of development will be necessary to reach the 30 -knot mark. One thing is certain: that unless our naval architects can find some form of propeller that will show a much higher efficiency than the best of those now in use, the 30 -knot liner must be driven of those now in use, the $30-\mathrm{knot}$ liner must be driven
by some other form of motor than the steam turbine. by some other form of motor than the steam turbine.
It will be a far greater task to raise the speed from 25 to 30 knots than it was to raise it from 20 to 25 knots. The resistance of a ship at these high speeds increases approximately as the cube of the speed. The cubes of 25 and 30 are respectively 15,625 and 27,000 ; and since it takes 70,000 horse-power to drive the "Lusitania" at 25 knots, it follows that 121,000 horse-power must be put into the ship to drive her at 30 knots. Now her present engines and boilers already occupy 450 feet of her length; and the doubling of her motive plant is evidently impossible. Future ships will of course be longer; but he would be a bold architect who would undertake to guarantee 30 knots, even in a 1,000 -foot vessel. If it were possible to get 80 per cent propeller efficiency, it might be done, but not otherwise.
aEronautics in war-a reductio ad absurdum.
Although it has become a truism that the aeroplane and in a less degree the airship, will find their most useful sphere in the field of military scouting, few people seem to have realized what a revolutionary effect the new means of locomotion will have We confess to a sincere dislike for that term "revolutionary" as ordinarily used, but here, for once, it can be truthfully applied; for if the airship can only fulfill its present promise, the time is not far distant when the art of war, as practised to-day, will. be stripped of its most important element of success, and its prosecution, at least along modern lines, will be its prosecution, at least along
rendered well-nigh impossible.
The strategy of ancient and medieval times wa simple compared with the complexity introduced by the invention of gunpowder and the present-day develonment of offensive weapons, the smallest of which, as carried by the individual soldier, is fatal at a distance of a mile and a half. The futility of frontal attacks made by massed bodies of troops; the necessity for made by massed bodies of troops; the necessity for
bringing bodies of men into action only over ground bringing bodies of men into action only over ground
where more or less cover is available; the decisive where more or less cover is available; the decisive
part played by the natural topography of the field of battle in determining the issues of the day, have given to strategy and tactics, but particularly to the former, an importance far greater than they held in ancient or medieval times, or even in the wars of the nineteenth century. And successful strategy is possible only when the movement of troops and their various dispo sitions can be clouded under a veil of close secrecy Secrecy is, indeed, the very soul of strategy, and with out it strategy becomes worse than useless, and merely a waste of time and energy. Should secrecy for some reason become impossible, war would revert to the methods of earlier times, and the outcome of battles would depend upon superior weight and numbers. Napoleon's famous dictum that God is on the side of the big battalions would again hold true.
Now there can be no question that the world to-day is in possession, or very soon will be, of a system of scouting which will destroy at once that very secrecy which is essential to successful strategy. Only a few weeks ago, as recorded by themselves in this journal, the Wright brothers were sweeping over the sand dunes on the coast of northern North Carolina in a machine which was perfectly under control, at a speed of from 38 to 42 miles an hour. These aero nauts are satisfied that the principles of the art, both theoretical and constructional, are now so well understood that it is possible to build an aeroplane that will carry a couple of men for hours at a time at a speed of from 50 to 60 miles an hour. Moreover, only a few days ago Count Zeppelin, in his Brobdingnagian steel and aluminium airship, proved that it is possible to remain in the air all day, and maneuver at speeds of over 30 miles an hour, and to perform these evolutions, if need be, at an altitude of several thousand feet.

Nov, to apply these facts to the actual theater of war, let us suppose that the general in command of the Russian army at Mukden had been in possession of half a dozen improved aeroplanes of the Wright brothers' type, and ask what would have become of the famous Japanese strategy, by which the eventual evacuation of Mukden by the Russians was brought about. A two-man aeroplane starting from Mukden, and carrying an operator and an intelligence officer with his sketching pad and notebook, and making a long, circular sweep to the westward, would have ena.bled the Russian commander-in-chief to keep in close touch with that famous flanking movement of Gen, Nogi's which decided the issues of the eleven days' fight. Soaring to a height of 1,000 or 1,500 feet, the machine would have carried the scouting party over the whole of the country covered by the flanking force, where note would have been taken of the numbers and character of the troops, the number of field pieces, and any and every detail of information that might be of use. From his lofty elevation the intelligence officer could have quickly sketched out a map of the chief topographical features of the country below, and on his return, the Russian general would have been put in possession of all necessary information to enable him to intercept the movement. As a matter of fact, the possession of a fleet of scout airships by two opposing armies would mean the complete demoralization of the art of war as it is now practised. Flanking movements; the position and strength of reserves; masked batteries; concealed troops; and unsuspected difficulties in the natural lay of the ground on the field of operations, would be perfectly well known to the enemy. The game of war would become almost as ridiculous as a game of chess in which each player told his opponent what was his general plan of attack, and what, in all probability, would be his next move. It certainly looks as though the present rapid development of aeronautics would reduce modern war to something very much like an absurdity; unless, indeed, some form of gun of small weight, great velocity, and capable of being trained rapidly over wide areas of the heavens be devised, that can "wing" an aeroplane at several thousand yards.

## PEARY'S QUEST OF THE NORTH POLE.

On Tuesday, July 7, the good ship "Roosevelt" started on her second voyage to the Arctic, and two days later Commander Peary left by train for Sydney, Cape Breton, where he joined the ship. Here the balance of the stores were taken aboard, and the crew, made up principally of men accustomed to Arctic navigation, was brought up to its full complement. From Sydney the ship will go to Hawks Harbor, where 25 tons of whale meat will be taken on board. She will then cross Davis Strait to Holstanberg, and proceed up the coast to Cape York. At Etaw the expedition will pick up the Esquimaux, upon whom reliance will be placed for the final dash by sled for the North Pole.
If experience counts for anything (and nowhere does it count for more than in Arctic exploration) the intrepid explorer stands a better chance of finding the object of his quest than any of the numerous explorers who have preceded him. No one man can compare with this naval officer in Arctic experience, and it is certain that no previous expedition has been so well found. The "Roosevelt," designed especially for this work, is a better ship than she was when in this same month, just three years ago, she started on her maiden voyage for the frozen North; for considerable changes have been made in the vessel, both in motive power and equipment, all of which were based on the valuable experience gathered during the last venture.
The "Roosevelt" is 160 feet long on the waterline, 184 feet over all, with a beam at the waterline of 32 feet. She is 16 feet 6 inches in depth, and at full lead displaces 1,500 tons. Designed, both in form and structure, to meet the severe conditions of the Arctic seas, she is considerably the strongest vessel ever built. She is very round below the waterline, with easy bilge and very sharp dead-rise; the wedge-shaped section of the hull being designed to cause the vessel to lift when she is being nipped by the ice. The enormous strength of the ship may be judged from the following details of her construction, remembering that she is built very largely of selected white oak The frames, which are molded to 16 inches at the heel and 10 inches at the head, are placed only 2 feet apart from center to center, and they are reinforced by a longitudinal lattice-work of diagonal straps of steel laid throughout the full length of the ship. The skin of the ship is 10 inches in thickness laid in two courses, the outer of which is of white oak, while the inside of the frames is covered with 3 -inch white oak ceiling. With three layers of planking and a sheath ing of tarred canvas between the outer two, the ship will be not only water-tight, but thoroughly warm in cold weather. The beams of the main deck are spaced 4 feet apart, center to center, and a system of heavy diagonal struts is worked in between the beams. In fact, the interior of the "Roosevelt" is a complicated system of horizontal and vertical trusses of great strength. Protection against the grinding effect of the ice is afforded by extra sheathing of hard wood over which is laid $3 / 4$-inch steel plating at the most exposed parts. The motive power of the "Roosevelt" is sufficient to give her about 11 knots an hour; but she will steam to the North at a lower speed, with a view to saving fuel.
Peary expects to reach the North Pole in the spring of 1909. With average conditions in the Arctic he hopes to reach the most northerly point of Grant Land, or say about latitude 83 deg., before he is frozen in. Temporary houses will be built on shore, and the crew will be occupied during the winter in preparing the outfit for the sled expedition, which will include fur clothing, sledges for the 420 -mile journey to the Pcle, harness for the dogs, and the repairing and packing of provisions. The start of the sledge expedition will be made a week or two before the sun shows his rim above the horizon, or early in February. The party will be made up of about twenty-flve sleds, with six dogs and one Esquimau with each sled. At the start they will be heavily loaded with provisions, and if Peary makes as much as 10 miles a day going out, he will be satisfied. Coming back, when the provisions have been largely consumed and the load is lighter he will make about 15 miles a day. Peary expects to locate his base of supplies and winter quarters somewhere in the vicinity of Cape Sheridan; and he stated, just before leaving, that if he should reach the Pole next winter, the news of his success will bs received in New York some time between August 15 and September 15 of next. year.

TEST OF SAFETY DEVICES BY THE PUBLIC SERVICE COMMISSION.
The Public Service Commission has done most excellent work during the twelve months it has been in existence, and its recent decision to hold a publi test of fenders and wheel guards suitable for use on the street railroads of Greater New York is highly commendable. That street railway accidents, and par ticularly the running down of pedestrians, are alto gether too frequent, must have been evident to the observant citizen of New York; but it has been re-
served for the statistics gathered by the Public Service Commission to bring home to the public the really frightful character of this menace to life and limb. The tests will be held within the next three months at the General Electric Works at Schenectady, and at the works of the Westinghouse Electric and Manufacturing Company, Pittsburg. The Schenectady trials will probably take place early in September, and will be followed by tests at Pittsburg one month later. Inventors and manufacturers of fenders and wheel guards from every State in the Union will be invited to participate, and to present their inventions for practical demonstration.

The decision to hold these tests is the outcome of the first year's experience of the Public Service Commission. Organized on July 1, 1907, the Commission had not been in office three months betore the humanity of its members was shocked by the terrible mortality due to acciajents on the street railroads. Under the Public Service Commission law, it is the duty of street railroad companies to report to the Commission at once every accident occurring on their lines resulting in loss of life, serious injury to persons, or great damage to property. For the first time it was possible for a public agency to collect the statistics of such accidents and focus the results in a series of monthly tabulations. It was found, much to the surprise and horror of the Commissioners, that the street railroads of Greater New York were killing men and women at the rate of 40 or 50 a month, and for the last six months of 1907, the number killed in this way aggregated 288, an average of 48 a month. To end such havoc with life and limb, became the Commission's immediate task. It had general investigations made of operating conditions on all lines of street railroads, and appointed a special committee on safety devices to receive and consider suggestions, inventions, and existing devices for the prevention of accidents. This committee consists of A. W. McLimont, electrical engineer of the Commission; Daniel L. Turner, chief engineer of the Transit Inspection Bureau; and George F. Daggett, chief of the Accident Bureau. Since its appointment last fall, the Committee on Safety Devices has had meetings every week, and has received innumerable suggestions for the prevention of fatal accidents. Inventors who have solved the problem only in their own brains; those who have gone a step further, and protected their ideas by patenting; as well as proprietors of marketable inventions, which are already manufactured and in general or restricted use, all flocked to the committee to have their devices tried.
As it became apparent from the reports of accidents that a large number was due to defective or imperfect fenders, or wheel guards, so the inventive talent of the country sensed the critical point, and by far the larger number of inventions submitted to the committee related to fenders and wheel guards. All these have been carefully examined, and so far as possible, given model tests in the offices of the Commission; but the committee soon determined that, in order to reach a just conclusion and to properly gage the merits of competing inventions, it would be necessary to hold public tests in a practical way. Its recommendation that the Commission provide for such tests was favorably considered, and after months of consideration, the forthcoming competitions at Schenectady and Pittsburg were arranged for.

It was found by personal investigation that the General Electric Works at Schenectady, and the Westinghouse Works at Pittsburg, not only afford every facility in the way of tracks, trolley wires, cars, mo tormen, etc., for such tests, but that neither the General Electric Company nor the Westinghouse Company has any interest whatever in any device which will enter into the competition. Hence they offered the best locale in the country, in the estimation of the Commission's engineers, to insure the impartiality of the test.
To test the qualities of a fender, dummies will be used to represent persons. These will be placed on the tracks, and will be run into by the cars with fenders attached at speeds varying from eight to twenty miles an hour. There will be three dummies, the largest one weighing 170 pounds, to represent a fulllargest one weighing 170 pounds, to represent a full-
sized man; another weighing 120 pounds, to represent sized man; another weighing 120 pounds, to represent
a youth; and the smallest weighing 50 pounds, to represent a child. Ten different tests with each dummy will be called for, including an upright posture facing the car and away from it; an upright posture with the side of the body toward the car; the position of lying on the track in various attitudes, the position of lying on the track in various attitudes, and lying along

## THE PRESENT POSITION OF THE DARWTNIAN THEORY.

 Many objections have been urged against the Darwinian theory. For example, most of the land birds of the Galapagos Islands are peculiar to those islands, but their close resemblance to South American species proves their descent from the latter. Why could not the differences have been produced by the direct influence of local conditions, without natural selection?Plants of the same species grow vigorously in rich soil but remain small and weak on poor soil, and flat fishes change color when removed to sea bottoms dif fering in hue from their native grounds. The question whether such direct effects of environment are hered itary is not yet decided, but there is no lack of other evidence in favor of the Darwinian, and against the Neo-Lamarckian theory. It would be a very remark able coincidence that cold should produce directly, in nearly all Arctic animals, the white coloration which is so eminently useful to them. The only exception among land animals is the carrion crow, to which whiteness would not be useful, either in obtaining food or in escaping foes. Many spiders which spin nets and lurk behind them are brightly colored, but hunting spiders can with difficulty be distinguished from their environment. Everywhere we find similar instances, which cannot be explained by the direct effect of local conditions but are in perfect harmony with the theory of natural selection and the survival of the fittest.

A second objection relates to the initial stage of useful characters, for the utility of this initial stage is not apparent. For example, many hymenopterous insects have on their forelegs a complicated apparatus for cleaning their antennæ. It must be admitted that a rudimentary and therefore useless cleaning organ could not be explained by natural selection. The or gan, however, pre-existed in the spur, common to al insects, which serves to steady the body on an uneven surface. The spur could also be used to clean the antennæ and it gradually assumed, by natural selec tion, a form better adapted to this purpose. Here we have an instance of change of function of an existing organ. The beginnings of useful characters can gen erally be explained in this way.
A third objection is based on the frequent occur rence of characters, such as the ornamental plumage of many male birds, which appear useless, or even prejudicial. To meet this objection a seeming digres sion is necessary
Recent researches have proved that every animal species has its definite place in the economy of nature. The bank swallow and the house swallow resemble each other very closely and are probably descendants of a common stock. The former broods in holes excavated in river banks, the other in nearly closed plastered nests attached to house walls. Probably their common progenitor utilized natural rock and earth cavities. Birds possessed of some skill either in digging or in plastering could improve their nests and their chances of producing offspring. Both of these useful characters would be inherited, and improved by natural selection. But why the sharp distinction into two species? Why, for example, do we not find diggers mating with plasterers? The house swallow, seen from above, is blue-black, and the bank swallow is grayish brown, like the earth in which it digs. This character, being useful in shielding the nest diggers from observation, would also be improved by natural selection. But, again, why the sharp separation into two distinct types and why do not some light-colored birds seek darker mates? To explain this we must assume a natural selection of another sort. As a rule the offspring of such a cross would have little skill either in digging or in plastering, while the mating of two light or two dark birds would produce good diggers or good masons. Hence the preference of birds of either type for mates of the same type would be of advantage and this preference would also be strengthened by natural selection.
When the superficial and auxiliary character which determines sexual selection is itself useful, as in the case of the bank swallow, this character (the earthy color) is equally developed in both sexes. When it is not useful it is developed most strongly in the male. This is the case with the black back and yellow rump of the house swallow. It may even be developed to an injurious extent by sexual selection and is then mostly confined to the male. Examples of this are seen in the brilliant plumage of male birds, whose mates, more exposed to danger in brooding, are very soberly clad. The females of birds that nest in caves are as brightly colored as their mates. The same is true of females that are well able to defend themselves, for example, wasps and bumble bees. In the latter case the conspicuous color is even useful in warning away disturbers.

The degree to which useful characters can be developed is determined by the competition of other species. Hence all animals are, in a sense, equally highly developed. To the constantly increasing division of labor in higher animals corresponds an increase in the complexity of the functions of protoplasm in lower animals. It is an error to assume that the vital processes (assimilation, reproduction, etc.) have always been as highly developed as they are now, for they also have been improved by natural selection in the struggle for existence.
The first living creatures differed from modern higher organisms by the absence of division of labor and from modern lower organisms by simplicity of vital processes. These considerations throw a new
light on the origin of life. Primitive organisms coming into existence now would be instantly destroyed by bacteria, but in the beginning there were no bacteria and the spontaneous origin of life was possible.
The degeneration of organs has becn brought forward as an objection to the theory of natural selection. Darwin himself thought it necessary to attribute to disease the degeneration of the eyes of cave-dwelling animals, forgetting that the formation and maintenance of useless organs, at the expense of useful organs, is detrimental and that such organs must consequently dwindle and finally disappear under the influence of natural selection.
Still another difficulty has been found in the failure to construct the pedigrees of living animals from the fossil remains of extinct species. But it is exceedingly difficult to determine the common ancestor of two species. It is commonly assumed that this ancestral form represents the mean of its descendants, but this is certainly erroneous. If the bank swallow should divide into two species distinguished by new characters, the lightness of hue, which distinguishes it from the house swallow, would still go on increasing, so that both new species would be lighter than their common ancestor. Hence the small size of some of the apparent ancestors of the horse presents no difficulty, and it is not surprising that no intermediate form between man and the anthropoid apes has been found. The human characters of these apes have probably become more pronounced since the separation, and the common ancestor may have been more like the lower monkeys than like the anthropoid apes.
The theory of natural selection assumes vital processes, heredity, variability, etc., as facts of observation and it is entirely independent of the theories that attempt to explain those fundamental data.

## SCIENCE NOTES.

In manufacturing operations it is frequently neces sary to use apparatus that is not affected by acids. In cases in which glass, porcelain, and similar materials are inadmissible the best material is platinum but the cost of this metal is often prohibitory. M. Jouve recently exhibited to the French Society of Civil Engineers a series of alloys to which he has given the name "metillures." They are silicides of iron and manganese, which contain a very large proportion of sili con and resist the action of strong acids, hot or cold, much better than the most resistant specimens of cast iron. For example, apparatus made of these alloys can be employed in distilling nitric acid, or in concentrat ing sulphuric acid to 66 deg . Baumé.

The Prussian forests, covering nearly $7,000,000$ acres, are made up much as if we should combine the pineries of the Southern States with the forests of some of our Middle Atlantic and Central States. When forestry was begun a great part of them had been injured by mismanagement, much as our forests have been, and the Prussian foresters had to solve the problem of improving the run-down forests out of the returns from those which were still in good condition. They solved it with striking success. Immense improvement has already taken place and is steadily going on. The method of management adopted calls for a sustained yield-that is, no more wood is cut than the forest produces. Under this management the growth of the forest, and consequently the amount cut, has risen sharply. In 1830 the yield was 20 cubic feet per acre; in 1865,24 cubic feet; in 1890,52 cubic feet, and 1904 , 65 cubic feet. In other words, Prussian forest management has multiplied the rate of production threefold in seventy-five years. And the quality of the product has improved with the quantity. Between 1830 and 1904 the percentage of saw timber rose from 19 per cent to 54 per cent.

## THE CURRENT SUPPLEMENT

In Chicago meat-packing establishments, electricity is employed very extensively and to great advantage Mr. Frank C. Perkins, in the opening article of the current Supplement, No. 1698, shows how the old system of shafting, belting, and pulleys has been sup planted by the electric drive. The making of briquettes with tar is described. Lawford H. Fry writes on combustion and heat balancing in locomo tives. The Duddell thermo-galvanometer, an instrument for measuring the extremely small currents and potential differences in the aerial wire of a wireless receptor, is described by A. Frederick Collins. Mr R. H. N. Robinson, of the United States navy, gives a description of the experimental model basin and of its functions and operations. How the speed of an aeroplane may be determined is explained by Dr. A. F. Zahn. The article on the making of moving pictures, which was begun in the previous issue, is concluded. Prof. A. Michel-Levy contributes a very good review of the work which has been done in arti ficially reproducing rocks and minerals. M. A. Lane contributes an article on August Weismann and his work. A. Cressy Morrison writes a general article on acetylene.

A NOVEL MUSIC STAND OR BOOK REST.
To make a music stand or book rest, such as shown in Fig. 1, out of one and the same piece of wood, without joining or the use of pins, seems almost impossible. Nevertheless, a novice, so far as the use of woodworking tools is concerned, will be able to make one by following the instructions here laid down.
The size of the stand will depend upon the use to which it is intended to be put. If for a music stand or a large book rest, eighteen inches wide by three feet long will be a nice size. If intended for the table, for smaller size books, the length would better be only eighteen inches, the same as the width
The board should be one and one-eighth inches thick, free from knots, cracks, and other defects. Either walnut, oak, or mahogany will do.
It would be well for a novice, in fact it would save time in any case, to have the saw cuts shown in Fig 2 done at a mill or carpenter's shop. As seen by the dotted lines and in the end elevation, these cuts do not extend the full length of the board, but to with in two inches of each other, at the center of the timber.
The board being cut, the next step is to mark five equally-spaced divisions, as shown in Fig. 3. The four short vertical lines are to be cut straight through the board, but the horizontal lines, joining them at the top and bottom, must only be cut half way through, or to the saw cut. The parts shown shaded are cut with a flat chisel, at an angle of forty-five degrees from the center, down to the vertical cut of the horizontal lines, as clearly shown in
the side elevation. The board is now turned over and the same cutting done but alternately, as clearly shown in Fig. 4, and in the halftone cut, Fig. 1.
The lower part of the stand can be cut out as shown in Figs. 1 and 4, or ornamented as may be desired, but the upper half should be kept perfectly plain. The whole must be sandpapered down, first with rough and then with fine paper, and afterward varnished or stained.
To hold the stand in a certain position, according to the use to which it is being put, an ornamental brass chain is connected across the bottom, by means of a screw eye at one end and a hook at the other. The stand can be folded and leaned against the wall when not doing service.
A small model of the stand makes a very interesting puzzle. If made as shown in Fig. 5, the two pieces of wood can be separated and twisted around at right angles to each other, as in Fig. 6. The device can then be given to a friend with a request that he get the two pieces apart, without breaking them. If the wood is sandpapered, and robbed of all traces of saw cuts, etc., the "puzzle" will deceive the most wary.

A MACHINE FOR HANDLING COKE IN THE YARD.
A MACHINE FOR HANDLING COKE IN THE YARD.
A radical departure from the method ordinarily employed to handle storage coke is illustrated on our front page.
Owing to the fact that coke is a very friable material, the use of a grab bucket or a steam shovel is
avoided where it is possible to do so; for it is necessary that the coke be delivered to the furnace in large pieces, and both of the above-named devices materially break up the fuel. The scraper conveyer of the machine here illustrated moves at a slow speed, and mechanically takes the coke from the base of the pile without in any way damaging it. The conveyer is filled by the coke rolling down the pile.

The photograph shows the machine at work on one


Fig. 1.-A Music Stand Made, Withont Joining, of Two Intermeshing Pieces.


Fig. $1 /$


Eiq: III.


Fig.IV.

The Evolution of the Book Stand.

## a novel music stand or boor rest

end of a yard at Stockton, Ind., where it is loading coke from a strip or siding one hundred feet wide, extending along the railway track about half a mile.

In one run, $43 / 4$ hours' time, there were loaded 24 steel hopper-bottom cars, containing in all 732 tons of coke. Three men operated the machine at a cost of $\$ 7$ a day for wages, making the cost per ton for loading less than one cent. The cost of loading this material by hand, which was heretofore necessary in order to prevent breakage, is 19 cents a ton. The machine consumed an average of $20 \mathrm{E} . \mathrm{H}$. P., which may be counted at 30 cents an hour. Adding this to the labor cost gives a total actual cost of a cent and a half per ton for the coke loaded. This means a saving over hand loading of about $\$ 125$ on the day referred to, exclusive of charges for depreciation.
The machine delivers the coke into the car in very much better condition than is done even by hand load-
ing, and it is estimated that a saving of probably 5 per cent will be made on this point alone. Coke on the yard costs about $\$ 5$ a ton, and this saving may be reckoned at 25 cents a -ton. The machine has four times the capacity of a locomotive crane and grab bucket, and handles the material without breakage.
The same argument as to breakage applies to stocking the coke on the yard, for the machine also does this part of the work. The coke is dumped on a plat form from hopper-bottom cars, on the trestle, the nose of the machine being swung underneath the trestle; the delivery conveyer stocking the coal at the apex of the pile, which may be as high as 40 feet, if desired The common method of putting coke into storage has been to dump a trainload of coke on the yard, jack up the track on top of the coke, and continue this operation until the grade the track takes to the top of the pile prohibits further storage. In doing this, every three feet of the pile is successively pounded down by a locomotive and train of loaded cars. The coke that is used for ballast in this way is poor stuff for the furnace man. The machine delivers the coke to the top of the pile without any drop, as the delivery con veyer may be raised or lowered to suit the height of the pile. When the pile has reached the desired height, the machine moves by its own power a few feet farther down the platform.

The Difference Between a Hydroplane and a Gliding Boat.
Structures embracing notch-bottom hulls are not hydroplanes, but gliding boats, as are also all those whose operation entails the use of supporting plates brought to the surface of the water, which is un avoidable in the absence of means for regulatins the lifting force of said plates.
The known methods of regulating the lifting force of $a^{-}$hydroplane plate are either to reduce its angle relatively to a longitudinal horizontal line as the speed increases, or to superpose upon it other plates which shall rise above the surface of the water, and thereby reduce the supporting area as the speed increases.
The word "hydroplane" properly applies to those boats designed to ride on submerged "planes," as distinct from the type that splash along the surface with the front edge of the plates protruding, the relation of which latter plates to the water is similar to that of the bottom of a motor boat.

The submerged plate of a hydroplane proper, being below the waves and foam of the surface water, may be compared, for illustration, with the supporting surface of an aeroplane. As a matter of fact, the upper surface of a hydroplane plate is almost as efficient as is the lower surface.

It is mentioned in an item in the Horseless Age that the city of Milwaukee will, in a short time, use no horses for municipal purposes, except to draw fire engines. The city officials are convinced that the automobile is so far in advance of the horse in cost, maintenance, and utility, that there is hardly any room for a comparison.


## A MULTIPLE MOLDING MACHINE.

by james cooke mills.
A new invention covering certain useful improvements in methods of forming sand molds has recently been introduced in the iron and steel world, and is acknowledged to be an important factor in foundry practice.
In the present state of the art it is almost universal practice in the formation of sand molds to fill the loose sand into the flask upon an up-facing pattern and then to compact the sand either by tamping or by pressure. The advantage of this method is that the inter that the inter stices of the pattern are fill ed with sand by gravity, while the impactofthe sand against the pattern face causes a certain degree of compression. As a conse. quence a perfect imprint of the pattern is thus initially formed and the subsequent tamping or pressure will impart the proper degree of hardness to all portions of the molding. face.
In multiple molding, where it is necessary to form mold-ing-faces upon opposite sides of the flask, the lower face only can be formed by this method. It has therefore been found imprac-
ticable to form a good imprint of the pattern upon the upper face of the sand for the reason that the movement of the pattern into the sand will cause the projecting portions to carry the sand away from the face of the depressions or interstices of the pattern, leaving soft spots in the molding-face, which will not retain the proper shape. Thus gravity, which assists in the formation of the molding-face against the upturned pattern, has precisely the opposite effect in the formation of the face by the down-turned pattern.
With the present invention difficulty of forming an imprint of the down-turned pattern is overcome by increasing the velocity of movement of the pattern relative to the body of loose sand to such an extent as to practically eliminate gravity as a factor and to compact the sand against the pattern-face by inertia. This may be accomplished either by moving the sand-


Fig. 1.-View Showing Yoke Swung Forward, the Drag Pattern, Fig. 2.-Side View of the Machine With Flasks Removed and Sand Frame Held by Magnets.
holder upward relatively to the stationary pattern or by moving the pattern downward relatively to a stationary sand-holder; but in either case the essential factor is the requisite velocity of the moving part. In carrying out the improved method the inventor, John A. Rathbone, employs a molding machine such as shown in the accompanying illustrations

With all its complexity, the machine is simple in operation and its action is positive. The operator sets an iron flask on the flask frame so as to engage the pins with the holes in the lower lugs of the flask.
having been turned, the electro-magnets hold the sand frame while the mold frame is carefully drawn away from the drag pattern by the reverse action of the ram. The drawing of the lower or cope pattern is done in precisely the same way. The flask frame is raised from the mold head containing the cope pat tern, by small pneumatic rams, leaving the completed mold free for stacking. The yoke is swung back and the mold lifted off. The patterns are cleaned by a jet of air through pressure hose.

The next mold is made in the same manner, except that the sprue for the mold now formed between the first andsecond flasks is cut through it au tomatically by the machine So mold after mold is made until, determined mainly by convenience in pouring, the topmost one is in position, when a larger pouring basin is shaped upon it and, if thought best, a pouring weigh is added. Except for the top mold, no weight is need ed, as the lower molds joints are mad good by the weight of the upper molds upon them.

It is generally supposed that the lower molds must be strained by the head of the liquid metal above, but, by a judicious apportioning of the section of, the gate to the massiveness of the casting, it may be caused to just feed it without straining and, for most of the work for which multiple molding is suitable, it is sufficient that the gate should be thinned down so that it has set by the time the second mold above is filled and the head is on the point of being increased by the filling of the sprue above.

A NEW BRITISH LOCOMOTIVE. by f. c. coleman.
The competition between rival railroads on longdistance runs, and the changes in urban local travel due to the opening of new suburbs and the competition of street railways, have led to a live forward movement in British locomotive engine construction. The latest of these giant locomotives built for long.

distance express traffic has just been completed at the London works of the London and South-Western Railway from the designs of Mr. Dugald Drummond, chief mechanical engineer of the company. The engine will run over the London-Plymouth route, a distance of $2303 / 4$ miles. Plymouth is connected with London by two competing lines, and as it is a port of call for Atlantic liners there is keen competition for the American as well as the local trade.
It is in accordance with the traditions of British rivalry that the officials of the London and SouthWestern Railway Company prefer not to make known full details of their new engine.
The engine is four-cylinder, six coupled, the cylinders being $161 / 2$ inches diameter, with a 26 -inch stroke. The driving wheels are 6 feet in diameter, and the bogie wheels 3 feet 7 inches. The total heating surface is 2,727 square feet, made up of $340^{\circ}$ boiler tubes equaling 2,210 square feet, 112 firebox tubes equaling 357 square feet, and the firebox, 160 square feet. The grate area is $311 / 2$ square feet, and tho working pressure of boiler 175 pounds per square inch. Four tons of coal and 4,000 gallons of water are carried in the tender; the heating surface of the tubes in the tender well is 382 square feet. The total length, engine and tender, over buffer, is 63 feet and the tractive force on rails is 30,968 pounds.

## A SELENIUM PHOTOMETER.

The inaccuracies of the photometric methods now in common use are well known. In many cases differences amounting to as much as ten per cent will exist between the estimates made by different observers with the best available scientific means of comparison. Furthermore, the colors of the lights to be compared are of great importance. The colors differ in the intensity of the effect produced upon the eye of an individual, and there is marked variation between different persons in this respect; so that by some observers two lights of the same color may be compared with considerable accuracy, but a change in the color of the standard will render the determination worthless. In addition, the practical impossibility of maintaining a standard light which will not vary from time to time with the pressure of the atmosphere and its specific composition at the place of test, and with the purity of materials used to produce the flame (a flame being usually employed for this purpose), affects the precision of comparison to a greater or less degree.
The common standard of comparison is the now well known "Pentane" lamp; the color of this standard is toward the red end of the spectrum, and to most eyes it shows decidedly pink. Hence, when an attempt is made to compare a yellow incandescent lamp, for example, with the standard, the results obtained from different observers are often so discordant as to make them of little use; it has therefore become a practice to have, a single observer compare a number of incandescent lamps with the selected standard with great care, so as to make them secondary standards, which when burned at proper voltage will give for a considerable perioū a substantially unvarying light. Ob viously, however, this introduces still further inaccuracies, since the lamps will, in spite of all possible care, differ among themselves, and comparisons made with them will necessarily differ by the personal equations of the different observers. In addition these equations vary in different ways with different persons, being dependent as already pointed out upon physiological factors such as the ocular perception of the individual, varying with fatigue and with physical condition, as is well understood.
To obviate all these difficulties Mr. William J. Hammer, a well-known New York electrical engineer, has devised and patented a very simple and ingenious photometer in which sensitivity of selenium to light is practically applied.
In an electric circuit a selenium cell of approved construction is arranged through which a current is passed, the changes in the current, due to the action upon the cell of the light selected for test, being indicated. The specific electric resistance of selenium varies over wide limits under the influence of light. In circuit with the cell and the source of current is included any desirable form of electrical measuring instrument. Preferably an instrument which will show variation in only one electrical quantity, since in any investigation it is best to employ only one variable at a time; but under some conditions other forms of measuring devices may be used.
In Fig. 1, $A$ is the battery or other source of current which is to be measured and variations in which are taken as indicative of light intensities. The battery is arranged in circuit with a selenium cell $B$, which is preferably of that form in which the selenium, after being coated upon a suitable conducting support, such as a coil of nickel wire, is sealed in a tube of preferably as nearly perfect a vacuum as can be obtained, the ends of the conducting wire being passed through the glass by means of platinum tips or otherwise; since the current is small, and no great heat is evolved, platinum is not necessarlly used.
$C$ is a measuring instrument, in the case illustrated a voltmeter, responsive to small variations of pressure. Upon a suitable table, $D$, is arranged the $\operatorname{lamp} E$ to be tested. At $F$ is a screen having a hole $f$ which may be closed by a slide $F^{1}$; in practice it is preferable to place the selenium cell in a light-tight box $M$ (shown partly broken away) having free ventilation, so that the indications may not be affected by exterior light; and inasmuch as the effect to be observed is not detectable by examination of the cell, it is necessary to open the box only at long intervals.
The method of operating the arrangement thus described is substantially as follows: A standard lamp of any desired construction, such as the Pentane lamp referred to in the previous description, is placed in proper position adjacent to the apparatus and lighted, being screened completely from the cell; a small current, preferably a small fraction of an ampere, is then caused to flow in the circuit including the cell, and after it has attained a steady value, the fall of potential around the cell is measured by the volt-meter. After this the light of the standard lamp is allowed to fall upon the cell, and the change in the resistance of the circuit (as indicated by the change in the drop) caused by the action of the light upon the selenium is measured and recorded; this then becomes a "constant" of the particular cell employed. After this, the light which is to be compared with the standard may have its specific effect upon the cell determined in the same way. Obviously the indications of the cell for the first specimens constructed must be calibrated by comparison with the results obtained by photometers, since the measurements of light now in use are purely arbitrary and have no relation to any definite physical quantity; but this relation having been once established in the manner indicated may be in-


## A SELENIUM PHOTOMETER.

definitely perpetuated by periodic comparisons of different cells to guard against change.
In Figs. 2 and 3, are shown a second means of practising the method. This consists of a siren-disk $G$ of well known construction in which the rows of holes $g g$ bear to each other certain definite relations, such as the notes of the scale. Opposite to, and rotating with this disk (the perforated disk being shown detached for clearness of illustration) is a disk $H$ bearing upon its surface conductors coated with selenium, one for each of the rows of holes $g$. The ends of the conductor go to collector rings rotated with the shaft, the whole being driven at constant speed. In the circuit with the collector rings and source of current supply is a coil $I$, disposed so as to affect a tuning-fork $K$ provided with a pointer $k$, the amplitude of vibration of which is recorded upon the revolving cylinder $L$, in the manner of a chronograph. The rows of holes in the siren-disk may conveniently be in the relation to the notes of the octave of a tempered scale, and may each be provided with a similar tuning-fork, which at the normal rate of rotation will respond to its appropriate tone; these, being. all substantially like the fork $K$ and arranged in a similar way, are not illustrated. Such an organization will enable the observer to conduct a number of tests at the same time, when desired.
The apparatus thus described being brought up to normal speed, which should be maintained as nearly constant as possible, the tuning-fork $K$ will begin to vibrate as soon as the standard lamp is turned on, and the amplitude of its vibrations will be recorded upon the cylinder $L$; upon turning off the standard and turning on the lamp to be tested the amplitude of the fork's vibration will indicate the intensity of the lamp to be tested, relative to the standard.

A telephone $N$ may be connected in circuit if desired,
either directly or inductively, and the note of the fork will then sound in the ear of the observer; an operator with a good musical ear may reach a very close approximation to a correct comparison by the relative intensities of the sounds produced by the two lights; this is, however, open (though in a less degree) to the objections pointed out with respect to visual photometers.
In Fig. 4 is indicated a construction which is cheaper and yet substantially effective. In this figure the cells $B$ are arranged upon a stationary support and the siren-disk alone rotates, cutting off and admitting the light by its rotation.

## An Earthquake Warning Service.

It is generally known that for the last few vears the great earthquakes which have occurred in distant parts of the globe, San Francisco, Chile, Mexico, and the West Indies, have been first announced to Europe, not by telegraph, but by the indications of the various seismological observatories of Germany and Italy. In fact, important tremors of the earth announce them selves in every part of the globe very soon after their occurrence by the vibrations which they impress upon the crust and the entire mass of the earth. There has been organized in Germany an earthquake warning service, operated without the aid of the telegraph, but simply by means of the diagrams traced by recording seismographs for the purpose of indicating promptly to great shipping firms the approximate location of the epicenter, or center of disturbance. After the earth quakes of San. Francisco and Valparaiso the Chamber of Commerce of Hamburg asked the director of the local earthquake station for a daily service of seis mograph records of the central station of Strassburg and determinations of the probable epicenters deduced therefrom. In consequence of this request a complete service was inaugurated on the following lines:
In order to determine without any ambiguity the approximate position of the center of a distant and powerful earthquake it is necessary to combine the data furnished by three stations; that is to say, by three seismographs. For these stations Hamburg, Strassburg, and Graz were selected. Immediately after a tracing of a distant violent shock is recorded determinations are made at each station of the durations of the two preliminary phases, from which the dis tance of the epicenter can be calculated by well-known methods. The stations of Graz and Hamburg telegraph their data to Strassburg, which, quickly combining the three results, telegraphs to Hamburg the probable situation of the epicenter. All this is a matter of three telegrams and a few hours of time On December 4, 1906, this method was applied to data furnished by Strassburg and Hamburg alone and consequently the result was less certain. Hamburg sent to Strassburg the following telegram: "Yesterday 231016, 1849, 2723"; and Strassburg replied: " 230954 , 231016, 1849, 2723"; and Str
This meant that at Hamburg the first shock began at 23 h .10 min .16 sec ., the second at 23 h .18 min 49 sec ., and the principal shock at 23 h .27 min .23 sec. The length of the phases being known it was found that the epicenter was distant 7,550 kilometers $(4,660$ miles) from Hamburg and 7,400 kilometers (4,598 miles) from Strassburg. Two circles drawn on a ter restrial globe around these two cities as centers, with the radii indicated above, were found to intersect each other in two points, of which one was in the Lesser Antilles, a region particularly subject to earthquakes and hence obviously the place of the disaster. By making use of three stations even this slight ambiguity is removed. It was not until the 7th of December, three days later, that a telegram from New York announced that an earthquake had occurred at King ston, Jamaica, on the 5 th, and it was not until the 26 th of December that it was known that the shock really occurred on the 3d. The importance of these earthquake warnings for great shipping firms is snuite evident despite the approximate character of the location of the centers derived from the seismograph records.

## "Wanted to Buy" Column.

The continued success of our "Wanted to Buy" items which are incorporated with our "Classified Advertise ment" column, is most gratifying, and has proven a real help to the manufacturer. One firm writes us as follows: "We thank you for the names furnished us in your last letter, and beg to advise you that with your kindness we are already in possession of an order. This is, without exception, the greatest stunt that was ever inaugurated, and it is an item for which the Scientific American deserves an endless chain of praise."

The Canadian railways had a total length of 22,452 miles on June 30, 1907, or 27,611 miles including double tracks, sidings, and spurs. The greatest mileage in any province was 7,637 miles in Qntario, and the least was 96 miles in Yukon.

## (10) orxempantente.

## Latticed Compression Members in Bridges.

To the Editor of the Scientific American:
It is not difficult to agree with the opinion you express in an editorial on "Rectangular Latticed Compression Members in Bridges," that more knowledge is needed regarding the strength of built-up compression members. To the attainment of this end, it is desirable that positive assertions concerning such members by a scientific or technical periodical of high standing should receive the careful consideration of bridge engineers, and should be questioned if they appear to be doubtful or in error. For this reason, I suggest your reconsideration of some of the statements in the editorial referred to.

You state: "We care not how expert may be the board that investigates the bridge; its findings with regard to these chords of novel and untested type will be based largely upon the theories which received such a staggering blow when the Quebec bridge fell."

Before the fall of the Quebec bridge considerable attention had been given by engineers to the theory of columns, and some progress had been made in this regard, but their practice, which was and yet is very diverse, did not, to any great extent, reflect this progress. In general, the numerous formulas in use for determining the main sections of compression members are not the expression of any theory, unless mere conjecture can be called theory, but represent instead formulated judgments; sometimes based on observation and experience, and sometimes' made, like the woman who made the pudding, "out of her own head." Assuming the correctness of the now generally accepted opinion (which was expressed by the Scientific American shortly after the disaster, and given by the Commission which investigated it) that the failure of the chords of the Quebec bridge was due to weak lattice bars, the accuracy of the formula by which the main section was determined was not tested. Regarding the design of lattice bars, the Commission, in Appendix 16 to their report, stated that "the experience of the Commission is practically the same as that of Mr. Szlapka, for, except the rule in 'Modern Framed Structures,' all the information we have been able to find has appeared in the periodical press since the collapse of the Quebec bridge." The Commission further stated that Mr. Szlapka used a modification of the rule in "Modern Framed Structures," and finally adopted a larger cross section than his method gave; and they commented: "If he had tested the method fully, he would have found it capable of giving areas ranging up to ten times the area computed by him, a result which would have shown the unreliability of this method." This "theory," if a method which admits of getting almost any result can be called a "theory," as far as the writer is aware has been used very iittle, if any, in general practice. Instead, engineers have relied on judgment in proportioning latticing. The writer's rule, which the Commission cites, and which, when applied by them to the Quebec bridge chord, required an area of 3.78 square inches for the lattice instead of 1.15 square inches as designed, was not a theory, but an expression of judgment, as was stated when it was first published in 1891.* It does not appear that generally accepte theories regarding columns received a blow when the Quebec bridge fell, but rather that individual judgment was faulty in a matter regarding which engineers have relied almost exclusively on judgment.

You state in comparing a compression member with four webs in which the lattice extends across the entire face, with a similar member in which each outside pair of webs is independently latticed, that "it should be remembered tha the latter trussing, because of its slight depth, is, for a given weight of latticing, greatly inferior tr latticing; which extends the full width of the chord." whis statement should be quali$f \subset$ d. The deep truss will be stiffer, but not necessarily stronger.
In trusses with parallel chords under a given transverse load, if the chords are weaker than the web members, an increase in depth will strengthen the truss; but if the web members are the weaker, a deeper truss with the same inclination and size of web mem bers will have no greater strength, as the stress in the web members depends on the shear and inclination of the members, and not on the depth of the truss. In compression members the situation is more complicated, and it is difficult to generalize. The shear is not a known quantity, but depends on a variety of causes, one of which is imperfect butt joints. For a given angle between the ends of unstrained abutting members, in loading the bridge, a greater shear will be developed, in bringing the ends to a full butt, if the members are deep in proportion to their length than if they are not.
When the lattice extends across the full width; of the member, unless additional provision is made, the brac-

Ing of the interior pair of webs will be imperfect, as was pointed out in the appendix to the report of the Commission previously referred to.
You further state: "There is only one certain way to determine whether these chords are able to take care of the enormous loads which will come upon them, and that is to build a model of say one-third full size, and test it to destruction in a testing machine." The writer does not dispute or underrate the importance of tests of full-sized or model members. When intelligently conceived and carefully made they can be of great service, especially if the critical conditions are so varied as to indicate their effect; but he does not consider the result of a test of this kind as conclu sive regarding the strength of similar members in actual service. In this regard it may be well to again refer to Appendix 16 to the report of Commission on Quebec Bridge. The Commission made statements bearing on this question in substance as follows: that the stresses in the lattice depend, in large part, on the obliquity of the line of thrust with reference to axis of the member, that obliquity depends upon excellence of design, accuracy of workmanship and precision in erection, that it is impossible to estimate the obliquity with accuracy under any set of conditions, but reasonable limits will doubtless be learned from experience and study; and that "a lattice column placed in a testing machine may fail in the web system, but this is no indication that the lattice system is strong enough for service in a similar column when in use as a bridge member. It may be that the obliquity of the load was too small to develop the lattice strength, and considerably less than the obliquity that would be found to exist on the bridge. With a greater obliquity the column might fail through the lattice system under a much smaller load.'
The writer purposely refrains from any discussion of the Blackwell's Island Bridge, as he intends this letter as a purely academic discussion of the particula points mentioned.

Henry S. Prichard
1526 Frick Building, Pittsburg, Pa., June 15, 1908

## A Motor-Driven Kite.

To the Editor of the Scientific American
As I am a constant reader of your very interesting journal on this side, and knowing that you have seri-

ously taken up the question of aerial flight, I give you an idea which I think may go some way to solve the problem, within certain limits, in a very simple way, and which you are at liberty to make use of for the benefit of your readers, some of whom perhaps may be able to see their way to take the matter up on these lines.

My idea is to uş an ordinary man-lifting kite, such as Cody's, and at i.ve ground end of the cord to fix an ordinary petrol motor with propellers, mounted on a light carriage to obtain the necessary momentum.
I think, in practice, with the apparatus properly proportioned, it should be capable of rising from the ground and being propelled in a horizontal direction also. Initially, a wind should be prevailing for the ascent of the kite; afterward, especially when going against the wind, the lift would increase, I suppose, as the square of the velocity, provided the kite remained in equilibrium, but this would have to be tried before saying definitely that this is the proper ratio. Anyhow, if any of your wealthy readers care to adopt my suggestion, they are at liberty to experiment on the same.
L. H. Nicholson.

London, England.

## The Curiosities of Numbers.

To the Editor of the Scientific American:
The explanation required by Mr. E. M. Brooks, in your issue of June 27, is very simple. As annexing
(or affixing) a cipher to any number multiplies it by 10 , it is evident that annexing to any number under 20 (either odd or even) one-half of itself, which will be one digit only or one digit and a fraction, multiplies the number by $101 / 2$, i. e., $11 / 2, \times 7$ times the original number, as stated by Mr. Brooks. As annexing to any number two ciphers multiplies it by 100 , the numbers from 20 to 199 inclusive increased as above will of course be multiplied by $1001 / 2(11 / 2 \times 67$ times the original number); those from 200 to 1,999 inclusive will be multiplied by $1,0001 / 2$. $(11 / 2 \times 667$ times $)$, and so on, ad infinitum. Thus:
$19+$ its one-half written after $=1991 / 2=19 \times 101 / 2$ $=19 \times 3 / 2 \times 7$.
$150+$ its one-half written after $=15,075=150 \times$ $1001 / 2=150 \times 3 / 2 \times 67$.
$1,777+$ its one-half written after $=1,777,8881 / 2=$ $1,777 \times 1,0001 / 2=1,777 \times 3 / 2 \times 667$.
Cowgill, Mo., June 28, 1908 . G. B. Cowley, M.D.

## Humane Cattle Killing.

Consul Maxwell Blake reports that in spite of much initial opposition on the part of Scotch cattle killers of the poleax style, a new device is being introduced in the Dunfermline slaughter house as a humane substitute for the old style of killing. The consul describes the new instrument as follows:

The weapon is about a foot in length. The barrel is rifled and the muzzle shaped like the mouth of a bell and angled in order to adapt itself to the slope of a bullock's head. By unscrewing the opposite end from the muzzle the cartridge may be inserted. The breech piece having been readjusted, there is a steel guard protecting the hammer, which sets off the bullet. This guard is not displaced until the weapon is about to be used. When the bullock has been firmly drawn up, the operator places the bell end well up on the forehead, and with a sharp tap of a mallet all is over, the beast generally falling down without a struggle. If the bullet has been properly placed, its path should be along the spinal cord, completely severing it. If the instrument has not been well placed, death is a little longer in ensuing, but in any case there is no pain to the animal. Care in the use of the weapon is all that is required, as it is not a thing which can be handled recklessly with impunity.

## THE NEW FRENCH AND GERMAN AIRSHIPS "REPUBLIQUE" AND "ZEPPELIN IV."

Within the last few weeks frequent dispatches from abroad have told of the successful initial flights of two noteworthy dirigible balloons, the "Republique" of the French government and the "Zeppelin IV." of Count von Zeppelin, which is to be purchased by the German government if it makes a successful long-distance flight of 500 miles from Friedrichshaven to Mayence and back.
The former of these two airships is simply an enlarged dirigible of the "Patrie" type, measuring 61 meters ( 200 feet) in length and 10.8 meters ( 34.4 feet) in diameter, and containing 3,700 cubic meters ( 247,205 cubic feet) of hydrogen gas. The motor is a 60 horsepower, 4-cylinder, Panhard, automobile-type gasoline engine. The two chief improvements in the mechanism and controlling apparatus are the rounding of the tips of the propeller blades and the placing of the vertical rudder at a certain distance back of the tail that projects out beneath the gas bag at the rear. The object of this space is to diminish the pressure upon the rudder of the rapidly displaced air. When filled with pure hydrogen, this new airship can carry a total weight of 1,345 kilogrammes ( 2,965 pounds) and traverse a distance of $800^{\circ}$ kilometers ( 497 miles) in one flight, and carrying a crew of eight men. Its speed is expected to reach 45 kilometers ( 28 miles) an hour. The speed of the "Patrie" was as great as this, but its radius of action was only 450 kilometers ( 280 miles) with a crew of four men. The inflation of the new dirigible required six days. As soon as it was completed, the airship was taken out of its shed, and made to perform evolutions for half an hour at a height of 300 or 400 feet, after which it landed readily. In a subsequent test it flew a distance of some twenty miles in about an hour. A significant fact regarding this new airship, however, is that the govern ment has decided to deflate it and transport it from Chalais-Meudon to the frontier point where it is to be put in service. "La Patrie," it will be remembered, flew successfully from P'aris to Verdun, a distance of 147 miles, when it was assigned to duty at this point, and the action of the French authorities in deflating the "Republique" would make it appear that they are afraid to trust their new dirigible to perform a longdistance flight.
As the "Republique" is the latest representative of the semi-rigid type of dirigible, so the "Zeppelin IV." is of the rigid type, i.e., the type in which the balloon is built upon a rigid framework so that it cannot lose its shape. In addition to this, the envelope itself is constructed of very thin sheet aluminium, which, should it be punctured or torn, can readily be welded by the new Schoop process. The 142 -meter ( 466 -foot) balloon is divided into about a dozen compartments,
which contain 13,000 cubic meters ( 459,090 cubic feet) of gas. The diameter of the balloon is 14 meters ( 45.8 feet).
The "Zeppelin III." was only 130 meters ( $4261 / 2$ feet) in length, with a gas capacity of 10,000 cubic meters ( 353,150 cubic feet). Its record for speed was about 33 miles an hour, and it remained in the air eight hours and covercd $2171 / 2$ miles.
After a short initial trial on June 21, some changes were made in the rudders. The manageability of the airship was bettered and, after a few subsequent demonstrations, it made a lon:- flight of some 248 miles, remaining in the air 12 hours, as reported in our last issue.
The new airship has separate power plants, each of which consists of a 120 -horse-power 4 -cylinder engine driving twin propellers. It is fitted with vertical rudders at each end, and at the rear there are slightly inclined, nearly horizontal stabilizing planes placed at an angle with each other of about 30 degrees. The new airship has shown a speed of $341 / 2$ miles an hour. The German government expects to have several duplicate air craft built by Krupp, and to use them upon the frontier.

## FIRST SUCCESSFUL FLIGHTS OF BLERIOT'S NO. 8 MONOPLANE

During the past month, M. Louis Bleriot has been experimenting with one of the two large monoplanes which he built last winter, and the first flights have in-

"Zeppelin IV"—The Huge New Airship Which Will Be Acquired by Germany After It Makes a 500-Mile Voyage.
A 120 -horse-power engine in each car drives two propellers. Note the stabilizing planes and rudders at the rear. The balloon is made of sheet aluminium laid over a rigid framework.
trolled. After increasing the size of the horizontal rudder, M. Bleriot, on June 29, made an official flight of 600 meters ( 1,968 feet) before the Aviation Commit-


Side View of Bleriot's New Monoplane in Flight.
Note the long uncovered body framework with the single horizontal and vertical rudder at therear. Also the elaborate bracing of the monoplane above and below.
dicated the success of this, the most advanced form of tee of the Aero Club of France, covering three times high-speed aeroplane. Two of our illustrations show the distance required to win a medal. The flight was
made against the wind in 47 seconds, the machine showing a speed over the ground of about 28 miles an hour. This is the first official record to be made by a monoplane. The machine showed good stability, and traveled very steadily. The photograph shows it descending at a slight angle. Subsequently, M. Bleriot made a circular flight of nearly a kilometer with this machine. The remarkable success that Bleriot had with a Langley-type aeroplane last year causes one to believe that he will yet make some excellent performances with his monoplane, and do much toward the perfecting of this type of flying machine.
farman coming to america after winning the

$$
\$ 2,000 \text { armengaud prize. }
$$

Henry Farman recently succeeded in making a 20 minute flight of 18 kilometers ( 11 miles) and thereby winning the $\$ 2,000$ Armengaud prize for the first $1 / 4-$ hour flight above French soil. He has contracted with a St. Louis syndicate to come to America this month, and it is expected that he will begin to make flights at the Brighton Beach race track on July 29. These flights will be made on three successive days, and again, on August 10, four days. They will be held under the auspices of the Aero Club of America, and it is expected that arrangements will be made so that Farman can fly for the Scientific American trophy. Delagrange also is to be brought over by the Aeronau tic Society. He is expected about August 20 , and he will probably give a series of flights at some place on Long Island. and flight and its appearance as viewed from the front. As can readily be seen, the monoplane is attached to the front end of a body frame 45.8 feet in length. The rear half of the monoplane, at its outer ends, has movable planes for correcting the transverse stability. The horizontal and vertical rudders are at the rear end of the body frame, while the 50 -horse-power Antoinette 8 -cylinder motor is placed at the forward end with the 4 -bladed propeller on its crankshaft. The blades of the propeller resemble a feather in shape, and they are rather flexible. The aviator sits back of the motor in the body, which is mounted upon two pneumatic-tired wheels in front and one at the rear

On June 23, at Issy-les-Moulineaux, M. Bleriot tried his monoplane in a rather strong wind, and succeeded in rising in the air several times for short distances, although the machine did not appear to have sufficient lifting capacity at the rear or to be very readily con-


Front View of the New Bleriot No. 8 Monoplane.
Note the movable wing tips and the 4 -bladed propeller with feather-like blades.


The Car of the " Republique," Showing One of the Propellers.


The French Government's New Dirigible "republique," Which Is a Duplicate of the Lost "La Patrie."

## the winning flight of the "JUNE bUG"

 aEROPLANE FOR THE SCIENTIFIC AMERICAN TROPHY. Nearly a score of Aero Club members and others interested in aviation made the trip to Hammondsport, N. Y., to witness the flight of the Aerial Experiment Association's third aeroplane, the "June Bug," on the Fourth of July, for the Scientific American trophy. The distance to be covered was a kilometer in a straight line, this being the required distance for the first contest. As Mr. Curtiss was the first aviator to come forward with a practical aeroplane and request a trial since the date of the first competition, September 14, 1907, according to the rules, if he performed the flight set, he would be the first winner. In order to permanently win the cup, he would be obliged to win it three times in separate years. The day at Hammonds. port was a typical Fourth of July, there being a number of thunder showers throughout the day, with clear ing weather late in the afternoon. Consequently, it was not until 5 P. M. that the aeroplane wa taken out of its tent and prepared for the trial. The tail w a s attached, the motor tested, and, after the photogra phers had takennumerous pictures, everything was in readiness for the flight. Mr. Charles M. Manley, the late Prof. Langley's assistant and an aviator of note, was the sole representative of the Aero Club's contest committee. In the middle of the.afternoon, Mr. Manley measured off the kilometer ( 3,280 feet), the distance laid out being actually 3,300 feet. The course started on one side of an old half-mile race track, and passed directly through a vineyard and several fields. It was also necessary for the machine to cross several barbed wire fences before it could fly-over the finishing post, which was surmounted with a red flag. Mr. Alan R. Hawley, the acting president of the Aero Club of America, was located at the finish, and Mr. Manley took the time at the start at the instant when the machine left the ground. Mr. A. M. Herring and the Aeronautical Editor of the Scientific American were located within a thousand feet of the finish.

By 6 P. M. everything was ready, and the air was quite calm. The machine was placed at one end of the course, the aviator took his seat, and the motor was started. The instant it was released, the aeroplane shot forward with constantly accelerating velocity. It required only 12 seconds and a distance of about 100 feet before it rose in the air. As he approached the end of the track, Mr. G. H. Curtiss, the aviator, steered his machine to the left, in order to pass around the vineyard. One of our photographs shows the aeroplane making the turn at this point. The machine kept rising, and Mr. Curtiss found difficulty in stopping this, although he directed the horizontal rudder downward to the full extent. Finally, he retarded the ignition of the motor, which caused the machine to slow down and drop. He was unable to rise again, and the machine

Copyright 1908 by Levick.
settled down gently in the high grass about 1,000 feet before it reached the finish.
Upon looking the machine over thoroughly after it had been pushed back to the starting point, it was found that the tail had been attached at too sharp a downward angle. This tended to direct the machine upward, and the horizontal rudder was not sufficient to counteract this. After correcting the inclination of the tail, and after going over the machine thoroughly to make sure everything was in good order, the second attempt was made at 7 P . M. In this flight the machine rose quickly, as before, and following the same course, it sped rapidly on at a height of some 20 feet. As it

The dimensions of the bowed surfaces of the tail are 10 feet long by 27 inches wide. The vertical rudder at the rear edge of the tail is 30 inches square, while the horizontal rudder is 30 inches wide by 8 feet long, with a section of 32 inches removed in the center. The surface of the tail is therefore $221 / 2$ square feet; that of the vertical rudder, $61 / 2$ square feet; and that of the horizontal rudder, $131 / 3$ square feet. The planes themselves have a surface of 370 square feet, and there are 35 square feet of vertical surface in the struts and running gear. The propeller is 6 feet 2 inches in diameter, with a 17 -degree pitch. As a $171 / 2$-degree pitch is equal to the diameter, the pitch, as can be seen, is slightly less than the diameter. The propeller is mounted direct on the engine crank. shaft, which makes 1,200 R. P. M. and de velops 25 horsepower. At 38 miles an hour, $t h$ e aeroplane lifts $26^{\circ}$ pounds per horse-power while the amount lifted per square foot of supporting surface of the main planes is $13 / 4$ pounds. For further particulars regarding this machine, we refer our readers to our issue of July 4.
An interesting point brought out by Mr. Curtiss is that
neared the finish post, it dropped to about 15 feet, and then continued onward, making a wide sweep to the left, and alighting without damage in a rather rough field. The distance traversed was easily a mile, and the time of the flight 1 minute $422 / 5$ seconds. This corresponds to an average speed of 35.1 miles an hour; but if the distance of 6,000 feet is taken as the total length of the flight (which distance has been computed by the members of the Association who are most familiar with the course) the speed of the machine was very nearly 40 miles an hour- 39.8 to be exact. Thus it will be seen that this aeroplane, with the total weight of 650 pounds including the aviator, and with the expenditure of 25 horse-power, is capable of very nearly the same speed that the Wright brothers claim for their 1,000 -pound machine with approximately the same horse-power. The reason that this new aeroplane is able to make such fast speed with so little horse-power as compared with the Farman and Delagrange aeroplanes, is that the tail has been reduced to a much smaller size than those used by the foreign aviators, and that, therefore, there is much less resistance or drag offered by it. The Wright aeroplane has no tail whatever, which is one of the main reasons for its high efficiency.


The Aeroplane Tipping as It Made a Sharp Turn After Leaving the Race Track.
Note the downward inclination of the left-hand wing tips for the purpose of righting the machine.
whenever he attempts to drive his machine around the vineyard mentioned, it invariably rises suddenly as if struck by some invisible force. Skilled aviators believe this is due to slight ascending air currents set up by the contour of the land at this point, and the vineyard may have something to do with it.
The next day, late in the afternoon, Mr. Curtiss made another flight, at the end of which he turned practically a complete circle. This flight was 4,500 feet in length, and lasted for $11 / 4$ minutes. The front wheel and several struts of the aeroplane were broken in the descent. This was the sixteenth flight of the "June Bug," and next to the trophy flight of July Fourth, it was the longest that had been made. Mr. Curtiss hopes to make exhibition flights with this aeroplane during the summer, and it is probable that after further practice above a suitable ground, he will be able to duplicate the performances of Delagrange and Farman. We congratulate him at his success in winning our trophy for the first time, and we hope that progress in aviation will be so rapid, that he will stand an excellent chance of winning it again in the future and much more difficult contests to be held.

A Canadian government survey party has been sent to lay out the town site of Fort town site of Fort
Churchill, th e future metro polis of Hudson Bay. The only settler who is now on the pro posed site, which is on the east side of Churchill River, opposite the Hudson Bay post, will be en titled to a free grantof 160 acres. The bill providing for the construction of the Hudson Bay Railway will be introduced into the Dominion Parliament soon but unless the present deadlock is broken, dissolution must come soon. No prog. ress is being made with legislation at present.

## HATCHING SNARES.

Because of the popular aversion to the serpent family, there is a surprising amount of ignorance about even the simplest of snake habits. It is doubt ful if many correct answers could be given to the guestion whether snal.es lay eggs or bear their young alive. As a matter of fact, some species are viviparous and others oviparous. Most of the poisonous snakes, as well as many of our harmless varieties, belong to the former class. In the case of the viviparous spe cies, the eggs remain in the oviduct so long that the young are hatched therein, while in other species the eggs undergo a partial incubation in the oviduct and are hatched soon after being laid. Such snakes are sometimes classed as ovi-viviparous.
The accompanying curious photographs show the young of the European ring snake in the act of emerg ing from their eggs. This species is closely allied to our common water snake and goes by the scientific name Tropidonotus natrix. Curiously enough, all other members of the genus Tropidonotus are vivi parous, and this species alone lays eggs. Further more, according to Gadow's "Amphibia and Reptiles," the new-laid eggs usually show not the slightest visi ble sign of an embryo, unless oviposition is delayed when the embryos are more or less developed. The eggs are laid in July or August in a soft bed of loam or decaying vegetation, or in a heap of manure. The older snakes sometimes lay as many as a dozen eggs or more, and they usually stick together so that the entire cluster can be picked up at once. Sometimes, however, if the process of laying is slow, hey will be separated, as shown in the photographs. The eggs are about an inch long and of a whitish yellow color. The shell is thin and flexible like parchment The young hatch in late summer or autumn Before hatching, they develop a sharp cal careous growth on the tip of the snout known as the egg tooth, with which the shell is slit open. Unlike hatching chicks, which are suddenly dispossessed by the breaking of their brittle shells, the young snakes may make many incisions in the parchment envelopes and take many peeps at the outside world before venturing forth into the new environment. Shortly afte hatching, the egg tooth is lost.
At first, the young live on insects and worms, but within a few weeks they are strong enough to attack and devour young frogs. Strangely enough, although the adults are strong swimmers, and spend much time in ponds and streams hunting the fish and frogs on which they subsist he young are unable to swim and they will soon drown if they fall into the water The European ring snake, as well as the American water snake, makes an excellent pet; it is perfectly harmless, becomes very tame, and learns to know the difference between friends and strangers. Gadow tells f a pet ring snake that would eat from his hand, crawl up his coat sleeve and coil itself contentedly on his arm.

## India's Petroleum Resources

Consul-General William H. Michael, in writing from Calcutta that the production of petroleum in India, outside of Burma, has not attracted much attention in the commer cial world, gives the following general information about these resources
India proper has her oil fields, and when they have properly developed will without doubt cut a considerable figure in the world's supply of oil produced from crude petroleum. At Kafir Kot this earth oil exudes from brown bituminous sandstone, and is found floating on the surface of springs. It is also found at Ratta Hotar hills, at Jobba, of Karsan, west of Chakratta, nine miles east of Kalabagh; at Dhardur, three miles west of Kabbakhi, in the salt range; at Narsinghpur, also in the salt range; at Jabba, near Nurpur; in the Algod Ravine at Kafir Kot on the Indus River, and in other places. The Bazar of Dehra Ismail Khan, on the hills of the Indus, had it for sale as a medicine long before petroleum was discovered in America, or had been developed in Burma. Petroleum was found many years ago in large quantity at a place called Makoom, not many miles from Jeypur, on the Dehing River. But the leads have remained comparatively undeveloped, and.it is as yet unknown to what extent petroleum exists in India.
In Assam the wells near Digboi are the most promis ing, a company with $\$ 1,550,000$ capital operating a large refinery there. There are twenty-two wells near Digboi, but five or six have been abandoned, as they were not sunk to a sufficient depth. However, while the deepest well goes down 1,865 feet, it does not yield as much oil as some that are little more than half as deep. The yearly output is now about 63 tons of candles, 573 tons of paraffin wax, and $1,200,000$ gallons
of kerosene oil. Nearly all the oil is sold locally in Assam, or in the neighboring districts of Bengal.

The government statistics do not show the amount of crude oil, refined oil, or paraffin wax derived from the Indian wells; but, whatever it may be, there is none of it exported from the country unless it be some of the wax. Burma (really a province of India) is the producer and exporter of kerosene oil and the by-products, such as paraffin. In 1906-7 she produced 137,654,000 gallons and exported in that year $55,796,000$ gallons, all of it going to Indian ports. The exports of paraffin wax amounted to 60,209 hundredweight, valued at $\$ 414,330$. The candles made of petroleum products amounted to $5,095,000$ pounds, valued at $\$ 473,330$.
The petroleum deposits of India, including Burma, have scarcely been disturbed, and the magnitude of the possible trade of India in the products of petroleum can hardly be estimated.

## The Earth's Temperature.

According to the Engineering and Mining Journal, M. Durnerin has recently communicated to the Société de l'Industrie Minérale the result of his observations on temperature taken during some deep boring operations in Meurthe-et-Moselle. The principal difficulties in the observation of the earth's temperature are currents of underground water, the admission of outside water into the bore-hole, and the heat produced by oxidation which goes on when the hole passes through carboniferous or pyritiferous strata. He found that

The Cause of the Bars at the Mouth of the Mississippi.
by orrin e. dunlap
The great bars at the mouth of the Mississippi River have cost the government untold expense; mil lions of dollars having been expended to remove them and to prevent their formation. A possible explana tion of these bars is suggested by certain discoveries of Edward Goodrich Acheson, of Niagara Falls, N. Y It was in 1901 that Mr. Acheson entered upon a series of experiments with clay. In the course of his studies he made several experiments on clay with extracts of plants, tannin being one of them. He then caused clay to remain in suspension in the water, making the clay so fine that it would pass through filter paper.
These effects seemed remarkable to him, and his thought was that they might be of considerable use in clay working. He searched available literature, and found only one reference to the use of vegetable matter in clay working. This was in the Bible, where we are told that the Children of Israel, under the instructions of the Egyptians, used straw in making brick. He also learned that the Egyptians substituted stubble for the straw, but as the fiber of straw is very weak, not nearly so valuable as a mechanical bond as many other vegetable fibers that were probably available to the Egyptians, his conclusion was that its use must have been for another reason. Straw contains no tannin, so if the effect he had obtained with tannin was due to tannin only, it was not likely to be produced by the extract of straw. He boiled some oat straw in water, and when he treated clay with this extract, he found it acted like tannin. Having determined this fact, he thought that the Egyptians must certainly have been familiar with this effect.
In the latter part of 1906, while making further experiments, Mr. Acheson thought that tannin might have the same effect on graphite as on clay. He tried it with satisfactory results. Later he found that the effect is obtainable not only with tannin and extract of straw, but also with catechu and the extract of sumac, oak bark, spruce bark, tea leaves, and a solution of dextrine, a list that might be much extended. All these substances, with the exception of straw and dextrine, contain tannic acid; and while early in his experiments he thought tannin was the active agent, in view of his later experiments it seems not to be.
In a paper entitled "Seventeen Years of Experimental Research and Development," read recently before the American Academy of Arts and Sciences in Boston, Mass., he said:
"Some months ago, while crossing the Mississippi River at St. Louis, I looked down from the car window and saw the great muddy stream sweeping to the Gulf; and having fresh in my mind the deflocculation of non-metallic amorphous bodies, it occurred to me that possibly the matter suspended in the water was in a deflocculated condition, and I remembered that I had been told that nearly if not quite all of this muddy water came out of the Missouri River from the great plains of the Middle West, and further, that the water did not clear during its entire course of some hundreds of miles, but that none of the muddy water was found at any great distance from its entry into the salt waters of the Gulf, the suspended material being deposited at the mouth of the river, there forming the great bars of the Mississippi. I also recalled the formation of the great delta of the Nile and I felt quite convinced, without an experiment, that the material was deflocculated and in a colloidal condition, and became flocculated and settled on coming into contact with the electrolyte-salt water.'
In his laboratory Mr. Acheson has a bottle of water carrying clay in suspension, the clay having been macerated with a little water and extract of straw in an amount less than one per cent of the weight of the clay. By filling two test tubes with the contents of the bottle, and after adding a little common salt (chloride of sodium) to one of them, it is found that within a short time the one to which the salt has been added is slowly clearing from the top downward. Within a few hours it becomes perfectly clear, all the clay being deposited at the bottom of the tube. This experiment seems to explain why the muddy waters of the Mississippi, Nile, and other rivers precipitate their suspended solid matter when they come in contact with salt water, showing how great bars and deltas are formed

The railroad traversing the Andes, connecting Guayaquil, the principal port of Ecuador, with Quito, the capital of the republic, is completed. The first train was run over the line June 25 , on which occasion there was a series of festivities throughout the republic.


## SEAL AND PROTECTOR FOR KNOTS

The usual method of protecting a package by means of sealing wax is not applicable to all classes of parcels. There has been a demand for something which could be applied to larger packages and bundles, and which could be more simply affixed. With a view to meeting this requirement the seal and protector shown in the accompanying engraving has been invented. It consists of a device which may be secured over the knot with which the package is fastened, and in such a manner that it will be impossible to untie the knot without breaking or damaging the seal. The device is very simple, and consists of but two members, $A$ and $B$. The member $A$ is a plate formed with four projecting arms, and the member $B$ is domeshaped, and has four arms adapted to fit over the arms C. In practice, the package should be tied with a knot joining four intersecting strands. It makes no difference what the form of the package is, or what its size. The plate $A$ is passed under the knot, and the dome-shaped member $B$ is placed over the knot, with the arms $D$ located between the strands, and in contact with the arms $C$. The arms of the two members are then joined together with metal fasteners of any well-known type. It will then be impossible to reach the knot with which the package is tied without breaking or prying open at least one arm of the seal, and if the fastener on this side is broken, it will be im-


SEAL AND PROTECTOR FOR KNOTS.
possible to insert a new one without the fact being evident to the person receiving the package. The inventors of this unique seal are Messrs. M. Dessauer and S. Baruch, of 175 Wooster Street, New York, N. Y.

## Battery for Converting the Energy of Combustible Substances into Electric Current.

## ву н. м. nichols.

An interesting method of directly converting the energy of carbon and other combustible substances into electricity is given in a recently issued patent. The inventor utilizes the energy obtained when sulphurous acid $\left(\mathrm{H}_{2} \mathrm{SO}_{3}\right)$ is oxidized to sulphuric acid $\left(\mathrm{H}_{2} \mathrm{SO}_{4}\right)$. He also utilizes the oxygen of the air for his depolarizing element. His battery consists of two carbon plates surrounded with granulated carbon and separated by a porous non-conducting plate of burnt clay or similar material. The two carbon plates act simply as inactive conductors for the oxidizing and reducing electrodes. The electrolyte used is sulphuric acid.

At the positive electrode nitric acid is added, forming nitrosyl-sulphuric acid. Air is forced through the compartment holding the positive electrode. The nitrosyl-sulphuric acid absorbs oxygen from. the air and this oxygen serves as the depolarizing element of the cell. Sulphurous acid gas is forced through the negative compartment and is oxidized according to the following equation: $\mathrm{H}_{2} \mathrm{SO}_{4}+\mathrm{H}_{2} \mathrm{SO}_{3}+\mathrm{H}_{2} \mathrm{O}=2 \mathrm{H}_{2} \mathrm{SO}_{4}$ +2 H . Sulphuric acid + sulphurous acid + water $=$ sulphuric acid + free hydrogen. The hydrogen passes through the electrolyte to the positive element of the battery as is the case in every electrolytic cell. Here it is oxidized to water by the oxygen absorbed from air
It is thus seen that the final result is a union of sulphurous acid, oxygen, and air to form sulphuric acid, the other elements remaining unchanged. The energy of this reaction is utilized as electricity.
It is stated that the voltage of this cell varies from three-tenths to five-tenths volts, depending on the de gree of concentration of the sulphuric acid.
The sulphuric acid obtained by the action of the bat tery is reduced to sulphurous acid by heating it with
a combustible substance such as coal, coke, wood, etc. This completes the cycle of obtaining electric energy from combustible substances, by chemical reactions only, without first converting the chemical energy into mechanical energy, as is done, for instance, when a steam plant is used to generate electricity.
It is stated in the patent specification that "it is evidently much cheaper to start large batteries of the kind herein described by employing other crude material for the production of sulphurous acid than by means of a reducing substance. Such methods as the burning of sulphur, the roasting of sulphur ores, the reduction of sulphates with carbon, etc., may be em ployed to produce the sulphurous acid required by the battery."
With our present method of generating electricity from coal only 5 to 10 per cent of the total energy of the coal is utilized. This new battery should utilize a much larger percentage of the total available energy of coal. The principal drawback at present to the commercial development of this battery is the fact that the apparatus is very bulky and a very large plant would be required to produce a small amount of power.

## HOME-MADE ROTARY PRINTING PRESS BUILT OF JUNK.

The design and construction of a good-sized rotary printing press is no small task for an amateur mechanic to undertake, even when provided with all the facilities of the up-to-date machine shop. But to build a machine out of junk with such chance tools as one could pick up or borrow, seems next to impossible Such a feat has just been accomplished by the Rev J. P. Brooks, a Baptist minister of Glasgow, Ky. A photograph of the press is shown herewith. In its make-up one can trace the parts of mowers, binders, reapers, threshing machines, corn drills, oil-well machines, etc., collected from the surrounding country. This varied assort ment of junk has been assembled into a press capable of printing a sixteen-page daily paper for the city of Glasgow.
As a boy, Mr. Brooks was fascinated with the printing art, and he early entered into the printing business, using a small hand machine at first, and later a somewhat more pretentious second-hand press. But this press was not equal to his requirements, and lacking the money to buy an up-to-date machine, his only alternative was to build one himself. His vocation as a minister called him to different sections of the sur rounding country, and wherever he went he kept his eyes open for parts of machinery that might be used in his press. Friends loaned him the use of their tools; some of the lathe work had to be done in a neighboring machine shop, and some of it was done by Mr. Brooks himself on a home-made lathe. After much filing, chiseling, cutting, and drilling, the press began to take form. But more than the usual share of ill.fortune fell to the lot of this amateur mechanic. The building in which the press was constructed burned down and the machine that was just about completed was destroyed. A second machine was constructed out of the ruins of the first, but no sooner was it completed, than its builder was kicked by a horse and laid up with a broken leg in a neighboring county. To pay his expenses, the press was sold to a junkman. Mr. Brooks's third and finally successful attempt is shown in the photograph. It represents four years of hard work, and in it are some of the parts of the original machine recovered from the junkman. The press has a wooden frame. In fact, wood enters into the construction of the machine wherever consistent with strength and durability. Hampered by lack of tools and the necessary castings, many makeshifts had to be resorted to. The six cylinders of the press are made of thoroughly seasoned oak. The surface of the wood was driven full of nails, and then turned down in a lathe
The press can hardly be said to conform to any standard type, as the inventor has embodied many of his own ideas in its construction. It affords an excellent example of what the determination and perseverance of an inventor will accomplish, despite the of an inventor will accomplish, despite
greatest obstacles and discouragements.

## Electrical Teredo-Proof Wooden Piles.

A wharf builder of San Francisco was rebuilding an old wharf in which the piles were badly eaten by borers, when he came upon one that was perfectly sound. A careful investigation as to the cause of this singular exception revealed the fact that the pile had been used to support a live wire which was grounded at this point. Taking a clew from this fact, the wharf builder
decided to experiment with electricity in wooden piles, and he discovered that the teredo would not attempt to bore into a pile in which even a light current of elec tricity was maintained. A patent has recently been granted to Mr. Thomas Prudden, the discoverer of this idea, on a system he has developed for electrically protecting wooden piles from the ravages of the teredo.

## ROPE BRACKET FOR SWING SEATS

A patent has recently been secured on a bracket for securing the seat of a swing to the rope. A special clamping device is provided, whereby the seat may


ROPE BRACKET FOR SWING SEATS.
be released from the rope quite readily. The clamp is also so arranged that the seat may be attached to the rope at any point in its length, thereby permitting of the adjustment of the height of the swing without necessitating the untying of one or the other of the ends of the rope. As indicated in Fig. 1, the bracket consists of a plate $A$, formed with a flange on three sides. The flanges are adapted to engage the end of the swing seat, as shown in Fig. 4. Projecting upward from the outer side of the plate is a socket member $\boldsymbol{C}$. This is formed with corrugations $D$. A groove is cut in the opposite sides of the socket member, to receive the fianges $F$ of a binding member $E$. In practice, the rope is set in the recess of the socket member $C$, and the binding member $E$ is then brought into engagement with the grooves in member $C$, and jammed down, forcing the rope against the corrugations $D$. The bracket is thus clamped to the rope securely. In order to prevent too sharp a bend of the rope under the bracket, the latter is formed with a groove $G$, which is inclined, as indicated in Fig. 2. It will be apparent from the above description of the construction of the clamp, that the swing seat may be mounted and secured at any desired point on the rope. The inventor of this rope bracket is Mr. O. M. Stalson, Eau Claire, Wis., R. R. No. 1.
M. Kluytmans, the inventor of the divided dirigible balloon of Baron de Marcay, which we illustrated a short time ago, has received an order from the Russian government for a combination aeroplane and dirigible balloon. The gas bag will be of the divided type, since the inventor's small model dirigible in a recent test made a very good performance. Russia is also building a five-man dirigible, which it is expected will be completed by September.


HOME-MADE ROTARY PRINTING PRESS BUILT OF JUNK.

## RECENTLY PATENTED INVENTIONS. Electrical Device

SPARKING PLUG.-E. Moonen, 33 Rue
Dautancourt, and A. Dumatre, 64 Rue LaDautancourt, and A. DUMAIRE, 64 Rue Lamark, Paris, France. The invention relates to improvements in plugs for explosion motors,
by means of which it is possible to adjust the by means of which it is possible to adjust the
distance between the spark-producing surfaces distance between the spark-producing surfaces systems, to displace longitudinally the central rod, thus partly dismounting the plug. One object is to produce a plug having large surfaces between the sparking parts, thus diminishing the wear of the surfaces and lengthening the life of the plug.

BINDING-POST.-N. Sohl, New York, N. Y. In this case the improvement relates to binding posts adapted to be used with electric wires and to afford a firm and positive connection therewith. Although adapted for general use it is especially designed to be used where vibra-
tions or jars would loosen or disturb the screws, bolts, or nuts ordinarily employed.

## Of General Interest.

FEED FOR GRAIN, ORE, AND MINERAL SEPARATORS. - W. Gray, Lincoln, Neb. invention which by delivering the materials on a horizontal plane or directly across a vertical spout and at right angles to the ascending air current, they are spread out in a thinner sheet so that the air current acts
therein more effectively, or in other words, forces upward and separates the ligh words, forces upward and separates the lighter mamanner than is practicable when the materials are discharged in a downward direction.

VUlCanizer.-W. D. Gratama, Rijswijk, Netherlands. The invention pertains to improvements in vulcanizers for vulcanizing end-
less or very long strips, belts, rods or the like of gutta-percha. India rubber, etc., also insulating wires or the like, whereby it is rendered possible to vulcanize these articles not by means ure, so that a better quality of the goods is insured
DEVICE FOR MAKING WIRE HATaim of this invention is to produce a device which will enable a wire frame to be formed with facility thereupon, and to construct the device with a view to securing accuracy and symmetry in forming the frame. The device is adaptable to changes in style and to arrange the parts so as
to be readily released.

## Hardware

COMBINED MEASURE, FUNNEL, AND FILTER.-P. MacA. Mackaskie, Central, Nev. Details are provided in this case for the con-
struction for a funnel, a coniform filter controlling valve for closing the spout of a funnel, whereby the funnel shell is adapted for use as a liquid measure, parts being so arranged that the contents of the funnel must pass through the filter before they are discharged through the funnel spout.
SAFETY-RAZOR.-J. C. Boyle, Calgary, Alberta, Canada. With the ordinary unguarded razor the sliding cut can be effected only by the most skillful operators, such as barbers. With this safety razor the sliding cut is auto matically and positively effected and requires
no skill or experience on the part of the user. no skill or experience on the part of the user.
As the blade itself is movable to produce the sliding cut, it is unnecessary to manipulate the razor in a peculiar fashion to effect this.

LEVEL-H. W. Brown, Waterburs
More particularly the invention relates to levels used by masons, builders, and others, in architectural and engineering work. An object is to provide a simple and inexpensive instrument, by means of which the elevation and alinement of objects at different points and in different directions can be ascertained.
WRENCH.-F. M. Damon, Seattle, Wash. By the construction of this wrench, the connection of its jaws will dispose it directly over
the saw teeth, and the pull on the lever will the saw teeth, and the pull on the lever will
exert draft force upon both jaws and at the center of the heel plate, so that there is no lateral strain which would have a tendency to break the coupling pin and thus endanger the

## Household Utilities.

ADJUSTABLE SHADE-SUPPORT.-T. C Howland, Long Branch, N. J. The shade support is slidably mounted in a bracket, the latter having its opposite side edges turned toward each other outwardly to form a guideway, and with the opposite side edges of the foot turned inwardly to fit and conform to the guidewas and the arm passing out between the opposed edges of the bracket.
mattress attachment. - C. Uhden and I. Owen, Spokane, Wash. The attachment is particularly useful as a bolster in connection
with a mattress body. An object of the invention is to provide a strong and inexpensive bolster adapted to be secured removably to a mattress and serving as a protector for the
feet, and for holding the covers of a bed in feet, and for holding the co
position at the foot thereof.

## Machines and Mechanical Devices. <br> ENGINE-STARTER.-C. B. Lazenby, Chicago, Ill. The invention refers more particu- larly to a starter especially adapted for use larly to a starter especially adapted for use upon a motor vehicle, and so designed as to be

readily connected to the stering mechanism
and operated therefrom and operated therefrom. It involves means
whereby the starting mechanism and steering gear are automatically detached of the engine is accomplished.
mechanical movement.-F. Crater, Parsons, Kan. This mechanical movement is
more especially designed for converting recipro cating motion into continuous rotary motion in a very simple and effective manner. It can be readily used for various purposes; that is, may be used in ratchet drills and for op
blacksmith forges and other machinery.

ANTIFRICTION WHEEL-BEARING.-W. J. Brewer, Trenton, N. J. The invention is designed to improve a form of roller bearing in which the journals of the roller bearings proings of the wheel or pulley to which the invention is applied and project also through plates which are arranged on the sides of the casing at the center through which plates the axle passes, and which are arranged to practically afford supporting means for the axle.
Valve.-C. Orenstein and H. I. Derby, are very expensive to cast and finish, by reason the number of ports, bolt openings, etc., it This invention does this by providing the seat with a deta-head, afforded by the valve-body, register with the respective ports and bolt by an intervening gasket.
RECORDER FOR MEASURING LUMBER.-
C. F. McLaughlin, Neame, La. The invention C. F. Mclaughlin, Neame, La. The invention ticularly to a device suitable for use as an attachment for planing mills and woodworking machines of various kinds; the purpose being operated upon by each machine, and to indi cate losses of time occurring in
removable wire calk.-G. S. Meyer, Newburgh, N. Y. The invention relates mor secured to the shoe and hoof, and presenting a plurality of projections serving to prevent the horse from slipping. The object is to provide to be attached when desired. The calks an connections are very cheap to manufacture The calks are firmly held in place, no specia
tools of any kind being required.

## Prine Movers and Their Accessories.

LUBRICATOR WITH SUPPLEMENTAR DELIVERIES.-J. N. Hochgesand, 200 Qua Jemmapes, Paris, France. The present invention has reference to an arrangement for regu lating delivery, applicable more particularly to lubricators, and enabling the position of the rod or at night by the to be known at a distance the method of mounting the needle valve; this is mounted upon a spiral spring attached to the end of the regulating rod. By this mean it is always applied exactly to its seat.

## Railways and Their Accessories.

Car-RELEASE.-A. F. Biavati, Freeport in position, a car is moved into the wheel an the overhangs of the car roof engage rollers, hanging from the rollers. Frame plates rest by aid of flanged rollers upon the rails carried by the wheel. Means permit another car to be arriving approximately at track level it is let down upon the inclined track engaging the rails, and being released as the wheel turn
until its weight is supported by the rails. then glides down the incline, being ultimately brought back upon the track.

## Designs.

design for a bottle.-F. J. Probst, New York, N. Y. In this ornamental design for a bottle, the body thereof is formed with a
small blunted point at the top and swellin out into an egg shape it abruptly rounds out into a nearly oval form. Two small tapering shapes carry the structure to a small stopper at the bottom
Note.-Copies of any of these patents will be furnished by Munn \& Co. for ten cents each. Please state the name of the patentee,
the invention, and date of this paper.

INDEX OF INVENTIONS For which Letters Patent of the United States were Issued for the Week Ending

## July 7, 1908.

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

 ards
Advertising
navigation,


|  |  |
| :---: | :---: |
|  |  |
|  |  |
|  |  |
| avator, J |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Floor dressing machine E. W. Whitmore.. 882.634 |  |
|  |  |
| it and |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Hestener for, A. Grein |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Gas, apparatus for manufacturing water, P. ${ }^{\text {Planting }}$ |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Granular or pulveruient material, receetaciele 892,32 |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Heel, boot and shoe, S. Burnham. $\quad$ Hi........ 8929647 |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Hoops, link conection for the ende of ree. 892,732 |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| (inder |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Knitting machine, straight, W. W. Burson 892 Knitting machines, pattern mechanism for <br> straight, J. Schutz |  |
|  |  |
|  |  |
|  |  |
| Lem, |  |
|  |  |
|  |  |
|  |  |
| Lead, making arsenate of, Luther \& Volck 892,603 ${ }^{\mathrm{s}}$ in steam apparatus, compound for ${ }^{892,521}$ |  |
|  |  |
| Leather, rawhides or skins, hoofs, horns, or bones of animals, treatment of waste, <br> A. G. Inrig |  |
|  |  |
| Letter sheet, W. T. Morrison ............. for Roseberry \& Junkin |  |
|  |  |
|  |  |
|  <br> rotary, D. $\begin{gathered}\text { A. Wilson } \\ \text {. } \\ \text {. }\end{gathered}$ |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |







Litle EViant




 Sn whe, simple and durable. Any mechanic can
operate them easily. Send for catalog. rate them easily. Send for catalog. C .

## Manufacturers

Can Increase
Their Business

Read carefully, every week, the Classified Advertising Column

## SCIENTIFIC

## AMERICAN

Some week you will be likely to find an inquiry for something that you manufacture or deal in. A prompt reply may bring an order.

Watch it Carefully

 saring machine, apple, W. H. Bouteli.
Paring machine, fruit, W. H. Boutell..
Pen attachment, J. Winger Paring machine, fruit, W. H. H .
Pen attachment. J. Winger
Pen, drawing, C. Fitysimmons.






\section*{| T |
| :---: |
| R |
| R |}



Rack, se
Ratioebry
Rail joint.




 Railway train safety appliance, electric,
T. Munger
Railway train safety appliance, electric,
H. Naus.
Railway train safety appliance, electric, Railway trin shoe, C . M . Hus.
Railways.




 Ronfing, sheet metal, L. Stcin
Rnotrong engine. A. I. Ostrander
Roving machines. etc.
 Rubher fastening device. H. R. Nelso
Runner. detachahle. C. F. Toenmies
Safe. vallt etc

 ash lock, M. R. Bull
Stop. M. Meem
Sas.
Saw. Sill Rose. M.

 Sewed ark, w. L. Se hring. Templeton.
Sewing artices, seam for, T. Libby
Sewing machin.


# Sherlock Holmes is Coming Back 

TW0 more "reminiscences" by Dr. Watson of the Great Detective are to see the light. The first one is entitled "The Singular Experience of Mr. J. Scott Eccles." It will appear in COLLIER'S for August $15^{\text {th }}$, which will be a "Sherlock Holmes" Number. There will be an intimate sketch of Sir Arthur Conan Doyle, creator of Sherlock Holmes, of his old teacher, Professor Bell of Edinburgh, who was the original of the Great Detective, and many anecdotes and illustrations of the unique place in literature and on the stage achieved by "the greatest character in fiction since Monsieur Dupin."

Here is what Collier's Fiction Editor wrote:
"I think I can safely say that it is one of the most remarkable detective stories of modern times. Not only is the plot novel, but the author brings to this tale all of the atmosphere of mystery and the extraordinary character drawing which long ago made him famous. I consider the story a great asset for any periodical. It is one of those cases where an author wins success along a certain line, creates a band of imitators, drops out for a time, and then, comes back as if to show just how good he really was.'

## Collier's

The National Weekly
Sherlock Holmes Number-August [ $5^{\text {th }}$

## DO Yu Want Good Inomandion Cinean?

Write to us and we will reeer you to a Scientific American Supplement that will give you the very data you need. Scientific American Supplement articles are written by men who stand foremost in modern science and industry

Each Scientific American Supplement costs only io cts. But the information it contains may save you hundreds of dollars. Write for a catalogue of SUPPLEMENT articles. It costs nothing.

Act on this suggestion!
MUNN \& COMPANY
361 Broadway, New York

## Classified Advertisements

 Advertising in this column is7 5 cents a line. No lessthan four nor more than ten lines accepted. Count
seven words to the line. All orders must be accom-
panied by a remittance. panied by a remittance. Further information sent on
request.
READ THIS COLUMN CAREFLLLY.-You will find inquiries for certain classes of articles numbered in write us at once and we will send you the name and
address of the party desiring the information. There is no charge for this service. In every case it necessary to give the number of the inquiry.
Where manufacturers do not respond promptly the
inquiry may inquiry may be repeated. MUNN \& CO.

BUSINESS OPPORTUNITIES

 N Inquiry
incubator.
TRAV ELING SALESMEN earn from 82,000 to $\$ 20,000$

 Jnquiry No. X61 nearest office. Mentionthis paper. THE COSMO Contracting Syndicate, Kingsway House,
Kinysway. London, buy Eng ilish patens of proved
ability-articles for mail order business pronounceable ability-articles for mail order business. pronounceable
figure codes, coding devices. Send particulars \& samples. Inquiry No. 8620.-Wanted to buy aluminium
cans. THE AMERICAN RIGHTS FOR SALE of fully pro-
 Inquiry No. R6.28. -Wanted to buy paving block
machines for use with partly fluid substances. PATTTERN LETTERS AND FIGURES (White Metal
and Brass) for use on patterns for castings Large van
riet prompt shipments. S Send for catalog. W .
 Inquiry No. 8632. - Wanted to buy machine for
perforating music rolls. WANTED-Useful Novelties, pract ical tools. labor
saving devices for use in shiping and iacking depart-
ments. Any good articles which will facilitate ship ments. Any good articles whols. Address B. \& S. Co.,
ping. nacking or branding goods.
Box 773 , New York City. Inquiry No. $\mathbf{~ W 4 6 . -}$. Wanted to buy cheap small
mottor. from 94 to 1 horse power, single phase 60 cycle, 110

PATENTS FOR SALE.
 Pegan, 713 So. East St., Indianapolis, Ind.
ble celluloid.
 lnquiry
machinery. No. 8650.-Wanted to buy file cutting
 Inquiry No. B65.-Wecatur, Texas.
turers of drop forged wrenches. FOR SALE.-Patent rights. No. 885.252, issued April
F2. 9190. Rake shoe. WWill
ailowed ourtint. Also patents gaoe, will be issued in July, 1908 For further par-
ticular and full information addess
Mant
Manutacturing
land, oregon. Inquiry No. $\mathbf{8 6 5 3}$ - Wanted addresses of dealers
in sheet steel, New York city preterred. WILL SELL STATES RIGHTS, Patent No. 888.668 .
Parachute Arrow. Most interesting and amusing toy.
Greatest advertising novelty of the day. Write for Parachute A rrow. Most interesting and amusing toy.
Graeest advertising ovoelty of the day. Write for
drawings. P. Inquiry
hardeners in New York.
S654.
 Mamisburg, Ohis.
Inauiry
making cutlery.

BOOKS AND MAGAZINES. BUILD MISSION FURNI'URZ. Send 20 cents for
three design of easily made pieces of furniture for
hall den or
putting torar.
puther directions for making and

 Boston, Mass.
Inquiry
machinery.

## MISCELLANEOUS.

IF YOU CAN HANDLE carpenters' tools and inter-
ested in motor moats, write
Harry A. Bush. Waite Street, Malden, lengh Mass. Inquiry No. $\mathbf{N 6 6 \%}$-Wanted to buy needle, pin and
pell machinery.

LISTS OF MANUFACTURERS.




 Inquirv No. 8ify.-Wanted to buy machinery for
cultvating rice and making Yuca starch.
Inquiry No. S678.--Wanted to buy cheap sewing Inquiry No. S678.--Wan ed to buy cheap sewing
machines.
Inquiry No. 8680.-Wanted to buy cheap watches. Inquiry No. 8681. - Wanted to buy envelope mak-
ing machines.
 Inquiry No. 8683. -Wanted to buy plant for mak-
ing cassava starch.
Inuiry No. 8685. - Wanted to buy $11 / 8$ to 2 -inch
Inquiry
No. 13 to 18 tempered 865 .-Wanting steed. to buy $11 / 2$ to 2 -inch
Inquiry No.

Inquiry No. N691.-Wanted to buy tor export to Inquiry No. 8692.-Wanted to buy kerosene oil
motors tor export.
Inquiry No. 8693 . - Wanted to buy meteorological instruments.
Inquiry No. 8694.-Wanted to buy fly wheels an
ball bearings. Inquiry No. 8696.-Wanted to buy toy balloons.
Inquiry No. 869\%. - W anted to buy zinc can scre Inquiry No. 869S.-Wanted to buy a hydrochloric
acid plant. Inquiry No. 8699 .- Wanted to buy two-stranded
soldered wire for heddies. Inquiry No. 8701.- Wanted to buy solar engines.
lnquiry No. SyO..- Wanted to buy double shaf luquiry No. \&yot.-Wanted to buy ink and mu
cilage bottles and labels. lnquiry No. 870\%.- Wanted to buy hand pnwer
vacuum cleaner. Tnquiry No. XV10.-For machinery for cardink
spinning and weaving jute. Inquiry No. 8y13.-For manufacturers and dealer
of cement manufacturing machinery and kilns.
 Inquiry No. N'1\%.-Wanted address of firms that
do $\begin{aligned} & \text { doond carving or stone carving, ornamental or in } \\ & \text { buildings. }\end{aligned}$
Inquiry No. $8719 .-$ For manufacturers of safes.
Inquiry No. 8 . 20 . Wanted for mail order business,
In
In
used
Inquiry No. 8721.-W
is used for structural work.
Inquiry No.
Inquiry No. 8y 23 .- Wanted addresses parties deal
ing in mining machinery such as used in gold mining. Inquiry No. $\mathbf{8 y} \cdot \mathbf{4}$. - Wanted to buy samples of va
rious kinds of Inquiry No. 8yg. - For manufacturersof a needle
threader, not the thimble and needle combination. Inquiry No. N', M26.-For parties who make "Yan Inquiry No. 8828.-Wanted the address of Th
Frear Novelty Co. Inquiry No. Nyg9.- Wanted a machine for manu
facturing berry -crates complete. Inquiry No. XY31.-Wanted a rice mill or huller
that delivers the rice entire and separate from the
hull. Inquiry No. Ly Ar2.-For manufacturers of indus-
trial alcohol machinery.
 makes the disks used to keep the head normaily closed
Inquiry No. S735. For parties making a still for
the purpose of extracting alcolol from sa w-dust. Inquiry No. 87 is6.-For manufacturers of machin-
ely for making matches, also machinery for making
purses and hand bags.
 vanzed water buckets. locks, nibs and holders.
Casquiry No. 87 $\mathbf{3 8}$.-For parties manufacturin Inquiry No. 8839.-Wanted machinery to make
pencil and pen retainer made of spring wire. Inquiry No. 8740.- For manufacturers of Chicago
typewriter.
Inquiry No. 8741.-For manufacturers of fireless cookers.
Inquiry No. N742.-For manufacturets of wate
still, also of thermometer tubing. Inquiry No. 8y43.-Wanted to buy a machine to
make macaroni, gapetti and dermicelli to turn out
100 J nquiry No. 88 44.-Wanted a machine for making
binuettes for fuel rom wooden shaving or combined
with pitch or other binder.
 feet, cross section approximating $14 \times 1 / 2$ inch, the end
being lapped and tacked.
lnquiry No. \&y46. -For dealers in paper and card
board making mactines.
Inquiry No. © Y48.- Wanted to buy polished or lac-
quered brass in sheets 29 gauge, quarter hard in temper.
Inquiry Yo. 8749.-For makers of very large
springs, used for running machinery.
Inquiry No. 8y51. - For manufacturers of brass,
tea, dessert and table spoons for siver plating.
Inquiry No. Ny52.- For manufacturers of paper
mill machinery for the manufacture of strawboard and
wrapping p aper.
wrapping pat.
Inquiry No. Sy53.-For manufacturers of
register revolving stands and hotel novelties.
Inquiry No. 8754.-For the party who makes an
umbrella which When raised allows the holder to stand
dir Inquiry No. 8855.-Wanted
lumber to be used box making.
Inquiry No. N75\%- Wanted address of the manu-
facture," of

side ct arc lamps.
lnquir $\mathbf{N o .}$ 8760.--For a manufacturer who can
manufacture a new type of hook and eye device. Inquiry No. Xy 61 .-Wanted to buy a small car-
riage propelled byelecricity so that a lame person may
get abuut by himself.
Inquiry No. 8y62.-For manufacturers of a pat-
ented pants strecher made mostil of wood, the
nop ented pants stretcher made mostly of wood, the top
and bottom clamps bing extended apart trot twooden
slins which are connected by some sort of adjustment
feature. feature.
Inquiry No. 87 63.- Wanted parties who can make
ornaments of wocd puip scroll-shaped. Inquiry No. Sy (64.-Wanted to buy smokers' fancy
 switches; also makers of insuating papers and toois.
Inquiry No. $\mathbf{~ p y 6 6}$. - For parties making pressed
Inquiry No. 8768 .- Wanted to buy cars for a
railroad witha ratius of 100 miles, which will run by
gasoline power.
 same a safety razor.
Inqu iry No. 7 .
link twist chains, links from parties ingh in.
Inquiry No. Ry 71 .-Wanted to buy tune sheets
for Criterion music boxes. Jnquiry No. Xy'g. -For a machine to make paper
bottles for holding milik.
Tnquiry No.
 Inquiry No. 8974.-For machinery for making
bags from sisal hemp.
Inquiry No. 8y75.-Wanted to buy stock novelty
or jewelry catalogues.
 vacuum cleaner machines.
plonquiry No. 8 Ny,
photographing outff forstreet used.

 stoves.
Inquiry No. W781.-For manufacturers of bass an
snare drum shells and hoops.


Sewing machines, cast off friction for, M.









alve, pressure reducing, T. Robinson t.i....
vats or keirs, machine for automaticaiy
folding or plaiting goods in, J. Grem-
minger



Wagon propeller, A. D. Austin
Wagon skid holder, J. Bast Ratiif.
Washboiler. W. W. Wilson ......







## Important Books

The Scientific American Cyclopedia of Receipts, Notes and Queries

## 15,n00 RECEIPTS

Price $\$ 5.00$ in cloth
This splendid work contains a careful compilation of the most useful Recepts and Replies given in the
Notes and Queries of correspondents as published in the Scientific american during the past sixty years together with mans valuable and important additions. Over Fifteen Thousand selected receipts are here
collected, nearly every branch of the useful arts being represented. It is by far the most comprehensive vol Industrial Alcohol

## ITS MANUEACTUPE AND USES

A Practical Treatise based on Dr. MAX MAERCKER'S
"Introduction to Distillation" as revised by Drs. DELbrück and Lange. Comprising Raw Materials, Mal Bre, Mashing and Yeast Preparation, Fermentation.
inistillation, Rectifcation and Puriflcation of Alcohol Distillation, Rectiffcation and Purification of Alcoho
Alcoholometry, the Value and Signiflcance of a Tax Free Alcohol, Methods of Denaturing, Its Utilizatio tor Light, Heat and Power Production, a sta
Review and the United Srates Law.
By JOHN K. BRACHVOGEL, M.E By JOHN K. BRACHVOGEL, M.E.
Pages 105 illustrations Price $\$ 4.0$

## GAS, GASOLINE and

 OIL ENGINESIncluding Gas Producer Plants
By GARDNER D. HISCOX, M.E. Price $\$ 2.50$
The only complete American b Jok on the subject for chasers of gas engines, treating fully on the construc tion, installation, operation and maintainance of gas, gasoline, kerosene, and crude petroleum engines.
The new rewritten, enlarged, and revised 1 thth edition The new rewritten, enlarged, and revised loth edition
of this work has been prepared to meet the increasing demand for a thorough treatise on the subject. Its
450 pages give general information for everyone inter 450 pages give general information for everyone inter-
ested in this popular motive power, and its adaptation to the increasing demand for a cheap and easily man-
azed motor requiring no licensed engineer. It is fully illustrated by 351 eng ravings and diagrams.

## Modern Machine Shop Construction <br> Equipment and Management

 By OSCAR E. PERRIGO, M.E. Nearly 400 Large Quarto Pages, 1llustrated ver $2 t 0$ Engravings Speciallyby the Author. Price $\mathbf{\$ 5 . 0 0}$ A work designed for the practical and every-day use
of the Architect who designs, the Manufacturers who build, the Engineers who plan and equip, the Superiptendents who organize and direct, and for the informa-
tion of every Stockholder, Director, Officer, Accounttion of every stockholder. Director, oficer, Account-
ant, Clerk, Superintendent, Foreman, and Workman of
the Modern Machine Shop and Manufacturing Plant of Industrial America.
American Tool=Making and Interchangeable Manu= facturing
By J. v. WOODWORTH
544 Pages 600 Illustrations Price $\$ 4.00$ A practical treatise on the Art of American Tool
Making and System of Interchangeable Manufacturing Making and System of Interchangeable Manufacturing
as carried on to-day in the United States. It describes and illustrates all of the different types and classes of
small Tools, Fixtures, Devices and Special Appliances small Tools, Fixtures, Devices and Special Appliances
which are in Eeneral use in all machine manufacturing and metal-working establishments where economy,
capacity, and interchangeability in the production of machined metal parts are imperative. It is a practical
book by an American Toolmaker, writte book by an American Toolmaker, written in a manner
never before attempted, giving the 20th century manunever before attempted, giving the 20th century manu-
facturing methods and assisting in reducing the expense and increasing the output and the income.

## Gas Engines and Producer=

 Gas PlantsBy R. E. MATHOT
320 Pages Fully Illustrated Price $\$ 2.50$ A practical treatise setting forth the principles of
Gas Engines and Producer Design, the Selection aud lnstallation of an Engine, Corditions of Perfect Operation, Producer Gas Engines and their Possibilities. The
Care of Gas Engines and Producer-Gas Plants, with Care of Gas Engines and Producer-Gas Plants, witb
Chapter on Volatile Hydrocarbon and Oil Engines Thoroughly up-to-date in its treatment of the subject, the work discusses at considerable length the genera-
tion of producer-gas and its utilization in gas engines. tion of producer-gas and its utilization in gas engines.
No other book in English presents anything like as full a discussion of this most important phase of the gas
engine. Indeed. no other book devotes even a chapter engine. Indeed. no other book devotes even a chapter
to producer gas. despite the fact that it is the coming
fuel for gas engines of high power.

Any of these books sent prepaid on receipt of price.
special circular of these broks will be sent to any-
MUNN \& COMPANY


CTMACHINES
MODEIS \& EXPERIMENTAL WORK. Y BAILLARD. 24 Frankiort Street. New York.
RUBBER
$\underset{\substack{\text { Expert Manufacturers } \\ \text { Fine Jobbing Work }}}{ }$
Experimental \& Model Work Electric GOODS.-Biq Cat. 3 cts. Want

## DIES MEADOUATERS FOR SPECIAL MACHINERY \& MODEL WORK 

HOEFT \& COMPANY Mo Makere. n nhindate MODELS Gears. EPERIMENTAL WORK
 DRYMM MCHINES: =


Telegraphy $=$ wiviz





## Garden Hose

## Rubber Belting <br> Steam Packing

## Rubber Specialties

N. Y. BELTING \& PACKING CO.

91 and 93 Chambers Street NEW YORK
write for Catalogue

## DECARBONIZER

chemically removes carbon from
cylinders, piston rings und valves. NCREASES POWER 20 PER CENT

 General Accumulator \& Battery Co
128 Second Etreet, Milwaukee, Wie.


BINOCULAR "PAGOR"
The smallest and newest PRISM GLASS made. Has not its Equ
sharpness and clearness.
Descriptive catalogue
C. P. GOERZ AMERICAN OPTICAL CO


 Improved Power or Hand Planer



 A. J. Wilkinson \& Co., Machinery, $184-188$ Washington St., Boston, Mas


We keep all kinds. Send your name
on a postal and get our 88 -page Booklet
Montgomery \& Co., 109 Fulton St., New York City


UUFKIN
TAPES AND RULES For sale everywherest vor sale everywhere. ${ }^{\text {Catalog No. }}$.
Cend for LUFKIN MRULE CO.

Trade Marks DESIGNS
PYRIGHTS \& Anyone sending a sketch and description may quickly ascertain our opiniou free whether an


## Scientific American.





## The Howard Watch

"Whether working or recreating I am lost
without my Howard watch," says a prominent Mining Engineer. "It is my time authority on everything from a Railroad to a roller chair." lines, who rely upon the Howard. The great achievements of the day are timed by it-from the big ditch of Panama to Peary's Arctic Fxpeditions. It is the watch of the men who do things.
The How ings. Howard probably does not weigh as much
 E. HOWARDWATCHCOMPANY, Boston, Mass.


COLD GALVANIZING
important patent decision
 IN EQUITY ON FINAL HEARING The Hanson \& Van Winkle Co. took up this fight
single handed sume six years ago. and have conducted
it at areat expense feel ins confident of final suce it at great expense, feel ling confdert of fnal suce cess the
athis seems a particularlo pportune time to call the
attention of all those intereted in
 Winkle company has brought this art and to the fact
that their salts and processes have now been authori-
tatively delared to be free and cear of infrinement on this patent, which had heretofore been asserted to
beall.controlling. Wh atever may be said of ils
validit gis ain validity Gs againg ot her may be said of its
and painst the salts
anfect.
efreses or this company the patent is of no While the process of the Hanson \& V an Winkle Com-
wany, as installed by their experts is simple and inexpensive, their intenti on is to install at once in the
larger cities outtits sin connection with the ir im proved
mech arger cities, outte in connection with the ir improved
menchanicallevices in order to show prospective users
the advantage of their methods.

## Eane

PIIERCEMOTOR BUATS $\$ 150.00$ and up MOTORS

Send stamps for catalog
Satisfaction guaranteed or money refunded PIERCE ENGINE CO., West Street, Racine, Wis Siegel-Cooper, New York City Avenne, Chieago
Butler Motor

## ROTHNEILER

THE WRENCH WITH A GRIP

年Something new at last in The Rothweiler ent from the old style pipe wrench-
And as much superior as it is
different-different-
It is lighter-
More powerful-
Has fewer parts-
Will give better serviceAnd will last longer than any
other pipe wrench on the other pipe wrench on the
market -
Made of the finest quality tool Eight sizes-
Eight sizes-
Household size $\$ 2.00$, express prepaid.
Write to-day for Illustrated
Booklet
Crescent Forgings Company 1203 Railroad St., Oakmont, Pa.


UBRICATES SEND
ANYTHING SAM
NBME


