


Of the total excavation of $1131 / 8$ million cubic yarus to be removed, 58 million will be taken out by dredging.
One of the Powerful Hydraulic Dredges in Operation.


Total length of canal, 442 miles. Total cost, $\$ 101,000,000$. Under contract, $1521 / 2 \mathrm{miles}$. Ready for contract, $981 / 2 \mathrm{miles}$ :
Laying the Concrete Floor of Lock No. 2 at Waterford. Dimensions: 45 Feet Wide, 12 Feet Deep, 310 Feet Long.

# SCIENTIFIC AMERICAN 

 established 1845MUNN \& CO.
Editors and Proprietors
Publishod Wookly at
No. 361 Broadway, New York
Charles allen munn, president 361 Broadway, Now York

FREDERICK CONVERSE BEACH, Sec'y and Treas. 361 Broadway, Now York
terms to subscribers.
One copy, one year, for the United States or Mexico
One copy, one year, for Canada.
.. ${ }^{\$ 3.00}$
One copy, one year, to any foreign country, postage prepaid, 188. 6d. . 4.50
the scientific american publications.
Scientific American (established 1845).
Scientific American Supplement (established 1876)..........................00 a year Scientific American Supplement (established 1876)............. 5.00
American Homes and Gardens ............................... 3.00 American Homes and Gardens.......................
The combined subscription rates and rates to foreign countries, including. 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, OCTOBER 3, 1908.
The Editor is always glad to receive for examination illustrated articles. on subjects of timely interest. If the photographs are sharp, the articles
short, and the facts authentic, the contributions will receive special at tention. Accepted articles will be paid for at regular space rates.

## TEE NAVAL AEROPLANE.

In spite of the final wrecking of his machine, the results achieved by Wright in the army tests at Fort Myer have proved so convincing, that one of the Navy Department bureaus is seriously investigating the question of their usefulness for scouting on the high seas. At the first blush, the proposal to transfer the aeroplane from the land to the sea will seem to many people to be a mere multiplication of the many and serious risks attending the operations of the aeroplane on land. "How will the machine start?" it will be asked. "How make a landing?" "And how will its half ton of weight be supported when it is afloat?" On considering the problem a little more closely, however, it begins to be evident that so far as the difficulties of starting and landing, etc., are concerned, they can, with a little ingenuity and proper design, be so far overcome, that the aeroplane may be, at least in the present stage of the art, handled more easily, and with less peril to the navigator, than it is under present conditions.
The navy is so far of this belief, that Lieut. George C. Sweet, of the Bureau of Equipment, is, we understand, working on the plans of a naval aeroplane, designed to be carried by our warships and co-operate with them in naval maneuvers. The changes which would be necessary to transform a military into a naval aeroplane are not by any means radical, and involve merely the substitution, for the present skids or runners of the Wright machine, or the bicycle wheels used by the Farman type, of some form of boat-like structure, possessing sufficient displacement to carry the weight of the aeroplane. Although the Lieutenant naturally is not making public his plans at this time, it is fairly certain that a pair of long, narrow, and finely-modeled hulls, attached below the machine, will be substituted for the present wheels or runners. These must necessarily weigh more than or runners. These must necessarily weigh more than
the Wright brothers' skids; but they need not be so the Wright brothers' skids; but they need not be so
very much heavier than the cumbersome wheels and framing of the French machines. When we remember that although the racing skiff used in sculling races weighs only 25 to 27 pounds, it is capable of earrying an oparsman weighing 200 pounds, it would seem to be quite practicable to build two shells weighing but little more than the carrying equipment of a land aeroplane, each capable of carrying half the weight of the machine, or say 500 pounds. Compared with the difficulties of starting on land, the naval aeroplane would be at a distinct advantage. Our battleships are capable of making from 18 to 20 miles, and our cruisers from 23 to 30 miles an hour. This last is the speed of our fast scout cruisers of This last is the speed of our fast scout cruisers of
the "Salem" class; and it would be more than suffithe "Salem" class; and it would be more than suffi-
cient to enable the Wright machine to rise into the cient to enable the Wright machine to rise into the
air and commence its flight. In practice, the aeroplane, furnished with its pair of shells, would be placed upon the fore deck, and the ship turned head to wind. When the speed of the ship through the air approached the proper velocity, the aeroplane engines would be started, and the machine would leave the vessel at a height of from 20 to 30 feet above the sea. The aerial scout, rising high into the air, would command a vast field of observation, and pos sessing a speed nearly double that of the warship, it could, upon discovering the enemy, quickly pass over him for purposes of observation. On returning te the parent ship, the machine would swing round into the
wind and come down gradually until it rested on its shells, when it could be towed alongside and taken on board by a boat crane.
It is not denied that in carrying out these operations, serious difficulties might be encountered. For the present, at least, and until the aeroplane has been greatly improved in stability, power, and ease of handling, it would be impossible to make any such fiight as above described in rough weather; but in calm weather, and even in moderate breezes with an easy sea, we can see no reason why it should not be accomplished. We are moving fast in these days, accomplished. We are moving fast in these days, and the wonderful flights of the Wright brothers
have so far established confidence in aeroplane flight, that the attempt to produce a naval aeroplane will be watched with the greatest interest, and no small degree of optimism.

## YACHT RACING IN 1908.

 Not for many years has there been so little inter-est in yachting as we have witnessed in this country during the season which has now drawn tc, a close. This has been due partly to the general financial depression of the earlier months of the year, and not a little to the growing popularity of the motor boat and the gas-driven cruiser. In Great Britain, on the other hand, the season has been marked by some very fine racing, particularly in what is known as the 23 -meter class, made up of four fine boats of about 70 -foot waterline measurement, designed under the new rule which aims to produce a yacht free from the exaggerations of form and sail plan which characterized the racing yachts built under the old waterline length and sail area rule. The first of this quartette was the "Nyria," which made her appearance in 1906, and by her good performance proved that it ie possible to combine high speed with good seagoing qualities. In 1907 two yachts, the "White Heather" and "Brynhild," were built to meet the "Nyria;" and in a season's racing the "White Heather," a Fife boat, had no difficulty in beating the previous year's champion. The present season was marked year's champion. The present season was marked
by the entrance of Sir Thomas Lipton into the class with a new boat, "Shamrock," also built by Fife. She has proved to be a most consistent performer throughout the season, winning, out of thirty-five starts, nineteen first and two second prizes. In light weather the "Shamrock" proved to be unbeatable; and in moderate to strong breezes she was about able to hold her own with the other yachts.
hold her own with the other yachts.
Naturally, the success of the "Shamrock" has raised the question of another race for the "America" cup, and it is not unlikely that a challenge will be sent over this autumn, asking for a race under the new rule adopted a few years ago by the New York Yacht Club. This rule is approximately similar to that under which the British 70 -footers have 'been racing this year. It was drawn up with a view to eliminating the broad and shallow body, deep keel, and enormous sail spread, which characterized the later boats built as challengers and defenders of the muchcoveted trophy; and there is a strong feeling in the New York Yacht Club that future races should be held under this rule. The latest announcement by the Cup Committee, however, was in favor of holding future races under the old rule, on the ground that it produced a faster, if less serviceable, vessel; the committee holding that the intention of the donor of the cup was to have it raced for by the fastest vessel that could be built, irrespective of the question of seaworthiness. Interest in the 70 -foot class in British waters next year, has been stimulated by the reported placing of an order by an American yachtsman with Herreshoff for the construction of a 70foot yacht, under the British rule, which will be sent over to try conclusions with the British quartette. If this boat is built, it will afford an excellent opportunity to prove whether Herreshóff can show the same superiority under the new as he has invariably done under the old rule.

WATER STORAGE DESTROYS THE TYPHOID BACILLUS.
It has been known for some years that the storage of water, undisturbed, has a beneficial effect in reducing the number of bacteria with whicn it may be infected. The question has recently been made the subject of extensive laboratory tests by Dr. A. C. Houston, Director of Water Examination, Metropolitan Water Board, London. Eighteen separate portions of water were infected with from forty to eight million typhoid bacilli, and bacterial counts were made, every week, until the typhoid germs had entirely disappeared. In one of the series of tests, ten of the portions of water failed to show any bacteria at the end of three weeks, sixteen at the end of four weeks, and in five weeks' time the whole of the eighteen portions failed to show any signs of the deadly germ.
The bearing of these laboratory tests upon the question of city water supply is evident; for where it is possible to store the water in suitable reservoirs, and maintain it in an undisturbed condition for a few
weeks before drawing off, the city using that water is provided with an additional safeguard against the greatly-dreaded disease. On the other hand, Dr. Houston does not consider that undisturbed storage should be allowed to take the place of filtration.
The latter has proved to be a most effective safeguard against typhoid, and storage should be looked upon rather as an additional protection, not as excluding the necessity for sand-bed filters. It is suggested that the time and expense of purifying a city's water supply might be reduced by using special storage reservoirs in combination with mechanical filtration at a specially rapid rate; and Dr. Houston expresses himself as being satisfied with a well-stored rapidly-filtered water, rather than an unstored slowly-filtered water. The difficulty of maintaining a sufficiently large quantity of water in an undisturbed condition for the necessary four or five weeks might be overcome by building such reservoirs in duplicate, the water being drawn off in one while the other was undergoing its period of rest. Though the cost of such a plant, especially in the case of the larger cities, would be heavy, it would be offset by the shorter time required to purify the water in the filtration beds, and the greater purity obtained by the tr:ofold treatment

PROGRESS ON PANAMA AND ERIE CANALS COMPARED. Public attention has been so strongly centered upon the progress of the Panama Canal, that the people of this State, and particularly of New York city, have failed to realize either the magnitude of the work involved in the reconstruction of the Erie Canal, or the extensive scale upon which the work is now being prosecuted. A comparison of the total quantities taken out on the two canals, during the years they have been in course of construction, shows that the State enterprise is quite comparable, in the magnitude of its operations, with that now being carried on by the Federal authorities. Active construction commenced on the Panama Canal in 1904 and on the Erie barge canal in 1905. During the first year of work at Panama, 243,472 cub-c yards were taken out; while 716,676 cubic yards were excavated during the first year of work on the barge canal. During the second year's work, $1,799,227$ cubic yards were taken out at Panama, and $1,460,705$ cubic yards from the barge canal. During the third year of work, the totals were respectively $4,948,497$ cubic yards and $4,500,459$ cubic yards. In the fourth year, $15,764,098$ cubic yards were removed at Panama. As 1908 was the fourth year of work on the Erie barge canal, the totals, of course, cannot as yet be given; but in July the total excavation was $1,067,111$ cubic yards, or 99 per cent of the amount taken out at Panama for July, 1907, which was $1,076,767$ cubic yards. In August of this year the total excavation was $1,091,891$ cubic yards, as compared with $1,271,966$ cubic yards taken out at Panama during August of last year. In this comparison the important point should not be overlooked that the New York State enterprise contains in its 442 miles of length a much larger number of structures compared to the amount of excavation than does the Panama Canal, the excavation of the Erie barge canal representing only forty per cent of the total cost of the work. In both of these enterprises the seeming delay in starting the work of active construction was due to the enormous amount of preparatory work in the prosecution of surveys, preparation of plans and estimates, and the purchase and placing on the ground of the enormous plant and supplies.

Attempts recently made to map out weather charts of the high sea between Europe and the United States are said to have proved entirely successful. Some pre liminary experiments commenced last year, not specially prepared, had led to some practical results in so far as the weather bulletins received from passing steamers allowed weather charts and weather prognoses to be established on the ocean. The more systematic experiments undertaken this year by Dr. Polis, director of the Aix-la-Chapelle metereological observatory, in conjunction with the Hamburg-American Line on their steamship "Kaiserin Auguste Victoria," have been prepared carefully, telegrams relating to the weather condition on the coast of Europe being transmitted daily by wireless telegraphy from the observatory above mentioned to the steamship on its way to New York throughout its voyage. If the American and European governments and other authorities lend sufficient aid, the missing link between the weather records of the two continents, viz., those of the Atlantic Ocean, will be completed in the near future, allowing the weather conditions from the western boundary of the United States to the eastern boundary of Europe to be surveyed daily. This would doubtless mean an extraor dinary advance in connection with weather prediction (which in the interests of agriculture has lately been promoted most actively by the German government), while yielding a most welcome aid to navigation. The progress of those experiments is accordingly watched with the keenest interest in German naval circles.

## THE HEAVENS IN OCTOBER. <br> by henry norris russell, ph.d.

A bright telescopic comet, with a long tail, was discovered photographically by Prof. Morehouse on the evening of September 1. Its orbit has now been approximately calculated, and it appears that at the time of discovery it was rapidly approaching both the earth and the sun, and consequently increasing in brightness. On September 15 it was about half way between $\delta$ Cassiopeiæ and the Pole Star, and was distinctly visible with a field glass. It is moving westward, almost parallel to the Milky Way, and on October 1 will be a little north of the star $\beta$ Cephei, after which it will continue to move in the same direction, nearly toward Vega.
Its orbit is such that it will not come within 100 million miles of the sun, or much nearer to us, but it will doubtless be visible with a field glass, and perhaps to the naked eye throughout October, though it cannot be called conspicuous, as was Daniel's comet of last year.

It is unusual for a comet at such a distance from the sun to have so conspicuous a tail. Perhaps this means that the comet contains more than usual of the very fine particles which are repelled by the presence of the sun's light, and form the tail (as explaired here some months ago). But this is rather a matter of speculation. If the comet came near the sun, it would probably be a fine object; but unless the approximate orbit deduced from the first three observations is very far wrong, this will not be the case; and if we wish to see a strikingly conspicuous one, we will probably have to wait till Halley's comet comes round in the spring of 1910 .
the heavens.
We may begin our identification of the constellations this month with the great square of Pegasus, which is high up in the southeast. It is so large, and the four stars at its corners are so bright and so nearly equal (all being of about the second mag. nitude), that it is one of the easiest figures in the sky to recognize.
Though called the great square of Pegasus, one of its corners is really in Andromeda, as our map shows. The ownership of this star (if we may so speak) was once some what in doubt, for some authorities formerly called it Delta Pegasi, thus de priving Andromeda of her brightest jewel. Now the question has been settled in favor of the lady, and all star catalogues refer to Alpherat as Alpha Andromedæ. Evidence of the dispute remains, however, for the next brightest star belonging to Pegasus
(which lies half way between the lower edge of the square and Altair) is not lettered Delta, but Epsilon, as if it was the fifth star in order of brightness in the constellation, and the fainter stars follow down the Greek alphabet after this, leaving Delta out altogether.
Before we leave the subject, it may be remarked that $\alpha$ Andromedæ is shown by the spectroscope to have a dark companion, revolving about it in a highly eccentric orbit, in a period of about 100 days.
The eastern edge of the great square, carried far southward, comes upon an isolated bright star. This is Fomalhaut, in the constellation of the Southern Fish-one of the most isolated stars in the heavens. Below this is the southern constellation Grus (the Crane), which though containing some bright stars, never rises high enough abowe our horizon to be con spicuous.
In the southeast is another lonely star, almost as bright as Fomalhaut. This is Beta Ceti, which although it bears the second letter of the alphabet, is the brightest star of its constellation. Cetus is one of the few cases where the Greek letters seem to have been scattered over a constellation almost regardless of the brightness of the stars.
The other prominent stars of Cetus are shown on
the map. The remarkable variable Mira, which bears the letter $o$, is now near its maximum brightness, and visible to the naked eye. Two years ago it was of the second magnitude, and for a few days the brightest star in the constellation. Last year it was hardly more than one-quarter as bright. It will be of interest to see how it behaves this time.
In the intervals between the maximum it sinks below the ninth magnitude, that is, to only $1 / 1000$ of its greatest brightness.
Of the zodiacal constellations which lie above those just described, only Sagittarius, setting in the southwest, and Taurus, just rising, are conspicuous, though Aries contains one star of the second magnitude, and Pisces is now enlivened by the presence of the planet Saturn. Along the Milky. Way is the familiar sequence of fine groups: Auriga low in the northeast, then Perseus, Cassiopeia, Cepheus, Cygnus, and Aquila, with Lyra below Cygnus in the northwest. Hercules and Corona, with parts of Ophiuchus and Boötes, flll the western sky. The Great Bear is below the pole, and the Little Bear and the Dragon are above it.
the planets.
Mercury is evening star until the 28th, when he passes through inferior conjunction, and becomes a


As her closest approach, or perigee, is near the time of full moon, we may expect unusually high spring tides, as was the case last month for the same reason. The moon is in conjunction with Uranus on the 3 d , Saturn on the 8th, Neptune on the 16th, Jupiter on the 20th, Venus on the 21st, Mars on the 23d, Mercury on the 25th, and Uranus again on the 30th.

Princeton University Observatory.

## THE LINER "CLEVELAND" LAUNCHED.

At the shipyard of Blohm \& Voss, Hamburg, Germany, there was launched on September 22 the steamship "Cleveland," the latest ocean leviathan of the Hamburg-American Line.

The "Cleveland" is a sister ship to the "Cincinnati," which was launched in July. These vessels of about 18,000 tons are destined for the service between New York, England, and the Continent, which they will enter in the spring of 1909.

In type they are similar to the well-known "Amerika" and "Kaiserin Auguste Victoria," although not quite as large. In the first cabin, accommodating not over 300 passengers, a notable feature is the large number of staterooms for the sole use of one passenger as well as the splendid suites.
The dining room on the upper deck will be equipped with small tables seating two, four, and six persons, a recent innovation which has become immensely popular.

Other public rooms are the spacious lounge, music rocm, writing room, smoking room, as well as the gymnasium with electrical apparatus. Sheltered corners, making it agreeable to be out of doors during all weathers, have been provided on both the spacious promenade decks. In addition to the abovenamed feature there will be an electric elevator, electric-light bath, a dark room for photographers, a bookstall, library, information bureau, etc.
The second cabin accommodates 350 passengers, and will contain the finest accommodations and conveniences ever offered in a transatlantic passenger steamer; the same applies to the third-class and steerage passengers.
The following are the principal dimensions of the vessels: Their length is 600 feet, beam 65 feet, and height from waterline to upper deck 55 feet. They are built of steel, pro vided with five decks and a double bottom extending the entire length of the ship divided into numerous water-tight compartments. As these ships will also carry large car goes of freight, they have been provided with facili ties which will enable them to load and discharge
morning star. On the 4 th he is at his greatest elongation, 25 deg. from the sun, but, being far south, is not well visible in our latitude.
Venus is morning star, rising about 2:30 A. M. on the 1st and $3: 10$ on the 31 st , and is exceedingly conspicuous.

Mars is also morning star, but is still pretty near the sun. Toward the end of the month he rises about 4:30 A. M.

Jupiter is also a morning star. Early on the morning of the 13 th he is in conjunction with Venus, the two planets being less than a degree apart. This gives the amateur who is enterprising ènough to get up early an opportunity to see the two planets in one telescopic field, and compare their apparent size and brightness.
Saturn has just passed opposition, and is observable all night. Uranus is in quadrature on the 6th, and comes to the meridian at 6 P . M. Neptune is almost exactly opposite him, and when he is in quadrature on the 10 th, he is due south at 6 A . M.

THE MOON.
First quarter occurs at 1 A . M. on the 3d, full moon at 4 P . M. on the 9 th, last quarter at 10 P . M. on the 16 th, and new moon at 2 A . M. on the 25 th . The moon is nearest us on the 7th, and farthest off on the 19 th.
the freight very expeditiously. The ships have four masts with twenty-four derrick booms. For the safety of the vessel all the latest appliances have been provided: An automatic hydraulic system for closing the water-tight doors separating the eleven water-tight compartments into which the hull is supdivided, auto matic fire extinguishers, intercommunicating telephones, submarine signal system, wireless telegraphy. The speed will be about 16 knots.

## A MOTOR-CAR LOCK IS WANTED.

Amotor-car lock which winke simple and thief-proof would be an invention which would appeal to motorists just now, and the wonder is that some such device has not already been included in the regular equipment of some make of car. It may be true that in some cities the removal of the starting crank or a spark plug or some other part of the mechanism is a guard against theft, but thieves are too often gradu ates of factories and carry a few handy tools along with them. Several instances have occurred of late in which the thief has supplied the spark plug himself. In one day the Detroit police received news of six thefts of motor cars. Three of the cars were discovered that evening.-Motor Age.

THE NEW YORK STATE BARGE CANAL.
Nature has provided two natural outlets from the Great Lakes to the Atlantic, one by way of the St. Lawrence River, and the other through the Mohawk and Hudson valleys. The first presents the great natural obstruction of the Niagara Falls; the second is intercepted by a range of hills and mountains, broken by a low depression at the junction of the Mohawk with the Hudson. As far back as the days of the Indian occupation, the Mohawk and Hudson valleys formed the main line of communication for the various tribes, and, with the coming of the white races, the importance of this route was emphasized, the tide of pioneer advance flowing steadily up the Hudson and Mohawk valleys to spread out ultimately on the prairies of the then Far West. As this route of travel grew in importance, it was utilized by every means of conveyance known to those early days, from the canoe and the packhorse to the lumbering stage coach. Ultimately, and inevitably, the government found itself confronted with the demand for improved means of transit; and as far back as 1793 the improvement of facilities for transit by water were begun by the construction at Little Falls of a canal about $31 / 2$ feet in depth by three-quarters of a mile in length containing five locks, which served to carry the water-borne traffic around the rapids. Shortly afterward similar improvements were undertaken at Rome and other places, and finally, in response to the rapidly increasing demands of traffic, the government undertook the construction of the Erie Canal, extending from the Hudson River near Albany to: Buffalo-a really stupendous work for that early day. The canal was opened in the year 1825. It was 4 feet deep, its least width on the bottom was 28 feet, and its total length was 363 miles. It contained 83 locks and 18 aqueducts, the total cost of the work being about $\$ 7,000,000$. Between the years 1836 and 1862 the canal was enlarged to a depth of 7 feet, and a least width on the bottom of 52 feet. The total number of locks was reduced from 83 to 72 and their size was increased from 15 feet by 90 feet to 18 feet by 110 feet. The total cost of the work was $\$ 32,000,000$.

Meanwhile the railroad system of the country was developing by leaps and bounds, and entering into keen competition with the waterway. The steady decrease in railroad rates, coupled with the shorter time of transit, was bound to tell heavily in their favor; and there was a steady transfer of traffic from the old to the new system of transportation. Practically no effort was made by the State authorities to meet this competition, and there was a constant heavy fall in the total amount of traffic, which decreased from a maximum $4,600,000$ tons in 1880 to $2,000,000$ tons in 1904. The only serious effort to alter conditions was the abolishing in 1882 of the tolls on the canal, which had amounted in the sixty years from 1820 to 1882 , to a total of $\$ 120,700,000$. In spite of the encouragement afforded by this step, it failed to win back the traffic from the railroads. In 1895 an inadequate attempt was made to rehabilitate the fortunes of the canal by an appropriation of $\$ 9,000,000$ for reconstruction; but
this amount was quite inadequate to enable work to be undertaken on a scale of any magnitude. In 1903 it was decided to put the question of reconstruction to the vote of the people, who by a large majority authorized the expenditure of $\$ 101,000,000$ in the enlargement of the canal. The new plans called for a least depth of 12 feet and a least bottom width of 75 feet, dimensions which will accommodate barges of 1,000 tons capacity. The locks were to be 28 feet in width, with a depth of 11 feet on the sill. Subsequently, and
of location carrying the new canal as much as 20 miles to the north of the old work. The Clyde River is followed to the Seneca River, which, in its turn, will be utilized as far as Three Rivers, where the Seneca and Oneida unite to form the Oswego River. At this point, a new stretch of canal will be formed in the bed of the Oswego River, north to Lake Ontario, the depth of the river being increased by the use of fixed dams. From Oswego River the canal continues easterly, following the Oneida River, to Oneida Lake, through which it passes, leaving the easterly end of the lake through the valley of Wood Creek, through which it is located to the city of Rome. At Rome the canal is carried by locks and across the divide, and enters the valley of the Mohawk River.
In the valley of the Mohawk between Utica and Schenectady, the canal will be provided with nine movable and two fixed dams. Eight of the movable dams will be of the bridge-and-gate type. They will have a maximum lift of 15 feet, and a maximum depth on the sills of 20 feet. By the use of these dams it will be possible to control the high floods to which the Mohawk is subjected, and operate the canal with as little inconvenience to the thicklysettled valley as possible. In 'order to avoid the big drop in elevation, which occurs at the discharge of the Mohawk into the Hudson River, the location of the new canal has been changed so as to enter the Hudson at Waterford by a series of five locks, in which the canal is brought down from an elevation of plus 151 feet to tide level. At Waterford the im
very wisely, the locks, in anticipation of a future widening of the canal prism, were increased to 45 feet width and 12 feet depth over the sill. With a view to this possible enlargement, the present embankments are being built so as to make it possible to widen the canal with as little expense as possible to 110 feet; and in canalizing the rivers, the channels are being dredged to a width of 200 feet.

The new canal, on leaving Lake Erie at Buffalo at an elevation of 565.6 feet above sea level, follows the Niagara River to Tonawanda Creek, and thence runs in an easterly direction, and generally parallel with the shore line of Lake Ontario, until the Oswego River is entered, from which point it continues in a generally easterly direction to a junction with the Hudson River at Waterford. After entering Tonawanda Creek, it follows the course of this stream until, at Lockport, it descends by a flight of two locks whose lift will vary from 49 to 54 feet, the lift being dependent upon the level of Lake Erie. From Lockport to Rochester the canal extends for a distance of 60 miles in a single level, crossing the Genesee River before reaching the city. At the Genesee River, harbor accommodation will be afforded by means of a pool formed in the river. Beyond Rochester the new canal coincides with the old canal until it enters the River Clyde near Lyons. Up to this point, the location of the old and new canals is practically identical; but beyond Lyons the old canal route is abandoned, and the new location has been laid so as to take advantage of the various river channels encountered, the change
portant branch known as the Champlain Canal starts north to its connection with the lake. From Waterford to Fort Edward the location will lie in the Hudson River, and the new route will take the place of the old land line located along the base of the foothills. Beyond Fort Edward, also, the line will be on a new location, and its final entry into Lake Champlain will be through Wood Creek, which will be canalized by the use of fixed dams. In this connection it is interesting to note that the Canadian government has prepared plans for the construction of a 12 -foot depth of water along the present route, from the mouth of the new canal through Lake Cham plain to Montreal.
An important feature, which should be remembered in judging of the magnitude of the work being done, is that the mere excavation represents but forty per cent of the total cost of the canal; the other sixty per cent covers the unusually large amount of constructional work, in the way of fixed and movable dams, locks, bridges, and other masonry and steel work. Thus, there will be a total number of no less than fifty-four locks, whose lift will vary from 6 feet to a maximum of $401 / 2$ feet; and of these, thirty-four will be built along the line of the Erie Canal proper. As showing the improved character of the new canal it should be mentioned that on the present Erie Canal there are no less than seventy-two locks. All of the locks will be 45 feet in width, with a workable length of from 300 to 310 feet, according to the character of the boats. Throughout the canal the masonry will be of concrete, composed of 1 part of Portland cement

 magnitude of the
work.
QUANTITIES OF EXCAVATION and CONSTRUCTION FOR NEW state bapge canal
Dredging york state barge canal
... 57,67,700 cubic yards.
Rock excavation
Embankment and back filling.
$132,927,000$ " "

Concrete

Active construction of the canal was commenced over three years ago, but on account of the extended surveys, c omparative studies, and preparation of contract drawings, the work could not be attacked on any considerable scale until the present year. On the first of August contracts had been made to the total amount of \$26,265,158 , covering $1521 / 2$ miles of canal; and on the same date, plans had been completed covering an additional amount of $981 / 8$ miles of canal and a large storage reser voir, which represented an estimated cost of $\$ 11,760,612$. Work on the canal is now in full swing; the total excavation on all contracts during July amounting to $1,067,111$ cubic yards, which is 99 per cent of the amount taken out at Panama for July, 1907.

Air-pump displacement should be one-seventy-fifth of the low-pressure piston displacement on a compound engine.


Sertuun or Canal Excavated in Soft Material. The Material Dredged Ont and the Earth Excavation Amount to on the Whole Canal 112,665,700 Yards


Lubecker Excavator. The Material is Dug from the Lett-Hanu sue or Machine, Emptied onto a Conveyer, and Deposited in Dump at Right.


Loenitz Rock Breaker. Operated by Lifting and Letting Fall the 15-Ton Iron Hammer Seen Below the Derrick.

The Sixth Tuberculosis Congress.
If there be any gatherings of more merit and endowed with more beneficent infiuence in shaping the future of our race than even peace congresses, they are the series of congresses on hygiene and demography, and principally those on tuberculosis, which have met during the last two decades. The present Congress on Tuberculosis now convened in this country is the sixth of its kind. It has never been surpassed in the wealth of material offered, and ats deliberations will give a vast impetus to the great work of eradicating a terrible plague. Some idea of the magnitude of this Sixth International Congress and its exposition and our own share in fighting consumption may be gleaned from the fact that of the 438 contributors to the exposition, 312 reside within the limits of the United States; 126 without. Two hundred and twenty-two of the number are collective contributions, that is, from associations, societies and other corporate bodies, and 216 from individual members of the Congress. Of the 222 collective contributors, those from the United States number 170; those from Europe or from other parts of America, 52. Of the 216 individual exhibits we are indebted to the United States for 142; to European and American countries outside of the United States, for 74.

The economical necessity of stamping out tuberculosis and thereby increasing national efficiency can not be more graphically presented than by condensing the able paper prepared for the Congress by Prof. Irving Fisher of Yale University. According to Prof. Fisher, tuberculosis costs, in hard cash, over one billion dollars a year. Consumption kills 138,000 every year in the United States. This is equal to the deaths from typhoid fever, scarlet fever, diphtheria, appendicitis, meningitis, diabetes, smallpox, and cancer all put together. The scourge picks out its victims when they are young men and young women, at the very time they are beginning to earn money. The minimum cost of such items as doctors' bills, medicines, nursing and loss of earnings before death amounts to over $\$ 2,400$ in each case, while the earning power which "might have been" if death had not come brings the total cost to at least $\$ 8,000$. If this is multiplied by the 138,000 deaths, we find the cost is bigger than the almost incalculable sum of $\$ 1,000,000,000$. Prof. Fisher estimates that over half of this cost generally falls on the luckless victim himself, but the cost to others than the consumptive is over $\$ 440,000,000$ a year. As a matter of self-defense it would be worth while to the community, in order to save merely a quarter of the lives now lost by consumption, to invest $\$ 5,500,000,000$. At present only a fraction of one per cent of this money is being used to fight the disease. Five million people now living in the United States are doomed to fill consumptives' graves unless something is done to save them. As each death means anxiety and grief for a whole family, Prof. Fisher estimated that there will be over $20,000,000$ persons rendered miserable by these deaths.

Government control of some kind seems an obvious necessity. In this country we are hampered by the constitutional requirement of respecting State rights. As Dr. H. M. Bracken pointed out to the Congress, there are interstate regulations relating to the shipping of hogs, cattle, and commercial products, but when the question of national legislation for the protection of human beings is raised, the question of States rights is brought forward and the proposed legislative measure is promptly killed. In a recent article Dr. C. Harrington drew attention to the remarkable difference which may exist under conditions fundamentally alike, in the matter of States rights, cit ing as illustrations the fact that while States rights prevented legislation for national quarantine covering a period of about a century, no strong objections, were made to the passage of national laws relating to pure food, packing house products, etc. The qugtion of States rights is easily thrust aside when it interferes with interstate commercial problems-another illustration of the greater value of the dollar than of human iffe. This very Congress bas reserved a whole section to the consideration of State and municipal control of tuberculosis, and of laws and ordinances relating to it. The time is approaching when the people will insist upon having their health safeguarded. We have in this country a cabinet with special members for law, for war, for the navy, for foreign politics, for internal political and economic improvements. Wie have a special department for agriculture, which supplies the people with rare and common seeds, and prevents and cures the diseases of common seeds, and prevents and cures the diseases of
their cattle. We even begin to make an end to our their cattle. We even begin to make an end to our
dereliction in allowing our forests to, be burned or stolen. We have, however, no central representation of the forces that make for the physical welfare of the people, and no United States board of health. Above all, the poorer classes should be enlightened on the dangers of consumption, a subject which Sherman C. Kingsley brought to the attention of the Congress. He showed that the necessities of life exhaust the earnings of a man earning from nine to eighteen dol-
lars a week, leaving no margin for emergencies. A call from the doctor means the price of a day's wages and a cut from the rent or the savings for shoes and clothing. For this and many similar reasons tuberculosis is far advanced when discovered among these people. The only hope of recovery depends upon early diagnosis. They live in the least favorable parts of the city, in tenement houses, in neighborhoods where milk and food supplies are inferior. In a recent examination of 150 families by Dr. Theodore B. Sachs, 25 to 30 per cent of all the children in these families showed signs of infection. The disease forces children out of school at the earliest possible age, exhausts family resources and vitality and fastens itself on the weakened members. The obvious needs suggested are more hospitals for advanced cases-hospitals that will gain the confidence of the people themselves and also satisfy the conscience of the community. We need more sanatoria for incipient cases, more funds to save fathers and mothers still in incipient stages, a wide increase of tuberculosis clinics, day camps, and church classes as adjuncts to the home care of patients.
The present movement is guided by the endeavor to put every personal consideration aside, and to bring before the Congress the newer and more recent means of grappling with the tuberculosis question. It would be impossible not to express gratification that the Congress has brought to our shores many who are of international reputation.

## Encke's Comet.

Encke's comet was reported from the Cape Town Observatory on May 28 last, about one month later than the time calculated by Prof. Backlynd. The discrepancy is easily accounted for by the perturbations which the body naturally undergoes as it travels among the planets. Next to Halley's comet, which will probably be photographically picked up in a month, and which will reach perihelion in 1910, Encke's comet is the most famous body of its kind. In the first place, it is periodical, and therefore belongs to a class numbering comparatively few comets. In the second place it has been made the subject of as much mathematical calculation as Halley's comet itself. As it now appears, Encke's comet seems dismembered, the tail being separated from the nucleus. It is rarely that any comet presents the same aspect twice in succession, for which reason this mutilation is not extraordinary. On some of its previous visits it has appeared almost tailless; on others it was a perfect comet of its kind. Unfortunately, the comet is south of the equator, for which reason it cannot be very well observed by many observatories of the world.

## Funeral of Lieut. Selfridge.

Lieut. Thomas E. Selfridge, the promising young army officer who fell to his death with Orville Wright in the latter's aeroplane on September 17, was buried with military honors in the Arlington National Cemetery, which adjoins Fort Myer, on the 25 th ultimo. The loss of this brilliant officer will be keenly felt, particularly in aeronautic circles, for he was thoroughly informed in the new science, and, as the secretary of the Aerial Experiment Association, he had had much to do with the development of aeronautics in America. The various aeroplanes built by this association, all of which fiew successfully, were designed by him, and the third of these, the "June Bug," on July 4 last won for the first time the Scientific American Trophy. Lieut. Selfridge is the first martyr to flight by a self-propelled heavier-than-air fiying machine, and it seems but fitting that a suitable monument should be erected on the spot where he fell.
Mr. Orville Wright is slowly recovering from the injuries he sustained in the fall of the aeroplane. His broken thigh is slowly knitting, and his ultimate recovery is only a matter of time.

## melting silica.

A. German firm has brought out a new process for melting silica and for molding it in various forms, using the principle of the electric furnace. The silica (guartz, etc.) is fused in a special type of furnace, and to this end it in placed in a carbon tube which is mounted horizontally or vertically as desired. This tube forms one of the electrodes of the furnace, and it is inserted in a larger tube which is used as the second electrode. In the space between the tubes is placed carbon powder or other conducting substance. One end of the inner tube is closed by a removable stopper. The outside of the large tube is closed by a cover which has such shape that it can be inserted more or less in the melted matter of the inner tube. A suitable housing of firebrick incloses the whole. The current is passed between the two carbon-pieces and the heat causes the melting of the silica in the best manner. When the silica is entirely fused it can be taken from the mold in the form of a solid block. On the other hand it can be molded by using an inner core which is placed inside the above-mentioned tube, so as to compress the silica within the latter. Steam or compressed air can be used to give the needed
pressure for the molding process. At the conclusion of the process the end of the mold is removed and the silica is driven out by means of the movable piece.

Wilbur Wright's Latest Aeroplane Records in France. On September 21, only four days after the accident to Orville Wright's aeroplane at Fort Myer, his brother, Wilbur Wright, surpassed all previous records by remaining in the air 1 hour, 31 minutes, and 20 seconds, during which he fiew 98 kilometers ( 60.85 miles) in a circular course above the military field at Auvours. The average height of the aeroplane above the ground during this fiight was about 25 feet, though at times Mr. Wright sent it up to an elevation three or four times as great. The machine fiew with great steadiness, and only alighted at the starting point when it became too dark for the aviator to see. The start of this record-breaking fiight (which surpassed that made by Orville Wright by 16 minutes and 56 seconds) was delayed until afternoon on account of a brisk breeze. At 4 P . M. three unsuccessful attempts to launch the machine were made. The trouble was found to be that one of the rollers of the car which carries the aeroplane on the starting rail was damaged. This was repaired, and at the next attempt the machine was started readily. A large and enthusiastic crowd witnessed this flight, which dispelled all doubts abroad as to the complete practicability of the Wright aeroplane and the possibility of making extended flights with it. A few days later, on September 24, Mr. Wright demonstrated that he could fiy in an 18 -mile wind. He remained aloft 54 minutes and 35 seconds, and fiew a distance of 39 kilometers ( 24.21 miles) in a circular course. When the aeroplane turned into the wind it slowed down perceptibly, while when it fiew with the wind it traveled very fast. The following morning a fiight of 36 minutes and 14 seconds duration was accomplished. After fitting division partitions in the new large gasoline tank in order to check the movement of the fuel from one end of the tank to the other (which tended to affect the equilibrium), Mr. Wright made a 5 -minute test fight. This was followed by a 9 -minute 1 -second fiight with M. Paul Zens as passenger, which was but 5 seconds shorter than the record one made by Orville Wright at Fort Myer when he carried Major Squier as passenger.

## The Current Supplement.

The current Supplement, No. 1709, opens with an article by our English correspondent on some highly interesting discoveries which afford conclusive evidence of a connecting link between the Greek art and the art of the Far East. Dr. Francis Darwin's striking paper on the movement of plants is continued. Prof. Harold Jacoby explains popularly the meaning of gravitation. Armor-bearing animals are described and illustrated. Inventors will read with interest some striking statistics on occupational mortality, which tend to show how much the inventor can do to ameliorate conditions in the factory and workshop. Dr. W. Donsell contributes an article on the preparation of tobacco. Very few people have ever heard of Count Francisco Zambeccari, yet he was the Zeppelin of his day. In the Scientific American Supplement will be found a description of his dirigible airship which sailed the air in the early part of the nineteenth century, A new gas locomotive embodying some novel features in its construction is described and illustrated. One of the latest developments in the application of armored concrete is the construction of poles and masts for the support of telephone and telegraph lines. An excellent article describes their manufacture. Wilson E. Symons writes on the future of the electric locomotive. The measurement of ocean waves is the subject of an article by J. B. Van Brussel, in which he describes a method of measuring waves, a method based on comparative measurements of spectroscopic photographs. A primer of wood preservation is presented by W. F. Sherfesee. The usual electrical notes and trade notes and formulæ will be found in their accus tomed places.

Visitors to California will have access to a third forest of giant redwoods when the counties of Tulare and Fresno complete construction of twenty-five miles of highway between Visalia and Redwood Canyon, in the Kings River country, where there is a grove o over fifteen thousand magnificent specimens of the Sequoia gigantea, many of which are said to compare in size and beauty with the trees of the Mariposa and Calaveras groups. It is probable that the property, which is as yet untouched by lumbermen, will be recommended to Congress for purchase as a national park. One tree in the redwood grove, recently meas ured by a government ranger, is 110 feet in circum ference and is estimated to contain 800,000 feet or lumber. A claim is made that a fallen giant in the region is the largest in the country. Located at an altitude of less than six thousand feet, the canyon would be accessible for a longer period than the other glant groves in the State.

## (Toxtexpondente.

## Prevention of Street Noises.

To the Editor of the Scientific American:
Your article in this week's issue on "The Street Noise Crusade and the Rail Joint" is very good on this cause of unnecessary street noises. By far the most noise is produced, to my mind, by the wheels on the cobble stones. If flat rails about five inches wide to admit of the different width axles were laid, making two tracks in every stone-paved street, the loads would be drawn much easier and faster by the horses. The noise would be greatly lessened, and the nervous system of mankind thereby incalculably benefited. The animals' endurance would be enhanced and businèss much more quickly handled. The expense would be more than compensated in various ways.

Fred. Bradlee Absot.
Sharon, Mass., September 4, 1908.

## Wreck of the White Mountain Express.

To the Editor of the Scientific American:
I read the above-named article in a recent issue of your valuable paper with much interest.
As you state, the train was hauled by a doubleheader. You give as a cause of the wreck the heavy lateral swaying motion of the electric locomotives that were hauling the train. I am of the same opinion so far, but furthermore believe that the main cause was the double-header. If a single engine had been used I don't think it would have occurred; and if it had been as heavy as both of those together, for a simple reason.

If the forward engine of a double-header strikes a depression, say in the left-hand rail, it will be thrown to the left, and after passing the place will sway to the right just in time to meet the second engine swaying to the left for the above reason. This will cause a heavy twisting motion upon the engine trucks, and tends to spread the rails, which it doubtless does when the locomotives weigh 95 tons and run nearly 60 miles an hour.
W. Mittendorf.

New Braunfels, Tex.

## Absorption of Amido Bodies from the Soll.

To the Editor of the Scientific American:
I notice in the issue of Scientific American of August 15, 1908, page 111, an article in regard to the absorption of carbon from the soil, and especially the utilization of amido bodies. In this connection permit me to call your attention to the fact that in 1897 I published an article referring to the same subject. This article was pubiished in Die Landwirtschaftlichen Versuchs-Stationen, vol. xlix, 1897, page 193, and in the Journal of the American Chemical Society, vol. xix, No. 8, August, 1897, page 605.
The complete data show that oats grown in soils rich in humus contain about 25 per cent more nitrogen than those which are grown upon ordinary agricultural soils, and that this increase in nitrogen is due directly to the absorption of amido bodies from the soil. Naturally, the whole of the amido body would be more or less completely utilized, and thus carbon as well as nitrogen would be assimilated by the plant therefrom.

Washington, D. C., September 10, 1908.
Science, Enunciation, and the Schoolboy Mind. To the Editor of the Scientific Americian:
In your issue of August 22 the article entitled "Science and the Schoolboy Mind" calls attention to the tendency of trusting to oral instruction in schools and the risks thereto. I would state that a great deal of the fault is not in oral instruction itself, but in the manner in which it is given. The tendency of the average teacher is to talk rapidly in explaining a lesson and, if I may say it, carelessly. This does not mean the use of improper grammatical English, but the improper enunciation thereof.

If, to quote the article, a pupil had heard the teacher say in a purely syllabic way the definition of the equator, the ridiculous interpretation of it as "a menagerie lion", would not and could not result.
In speaking syllabically the syllables are fully sounded, and a sufficient pause made between each, so as to prevent a blending together of the final and initial sounds. The length of this pause need not initial sounds. The length of this pause need not
necessarily be more than a fraction of a second. Too necessarily be more than a fraction of a second. Too
much stress cannot be laid upon the matter of correct speech, the lack of which is the cause of the errors stated. Teachers should be instructed especially in the great importance of correct speech, and especially in the classroom. In fact, proper enunciation of speech should be a sine qua non in the examination speech should
of teachers.
In syllabic speech a misconception of a word is impossible to the pupil's mind, because each sound is clearly enunciated and time given for it to make the desired impression on the pupil's mind. In rapid unsyllabic speech, the words are transmitted from the teacher to the pupil in such a way that there is a
confusion of sound, and a false impression is made upon the pupil's mind that can be removed only after a great deal of trouble. One can easily prove it by reading both the statement that "the equator is an imaginary line" and that "the equator is a menagerie lion" in a pure syllabic style; or better, read the statement both syllabically and unsyllabically. The difference will be such that no further proof is necessary. In fact, too great a stress cannot be laid upon this matter, which is so important and yet so utterly neg. lected.

Gerald Ellis Cronin.
Brooklyn, N. Y., August 30, 1908.

## Air Scouts and Artificial Fog.

To the Editor of the Scientific American:
A great déal is being said and written of late concerfing the influence the airship will exercise on modern warfare. Heretofore strategy, the doing of modern warfare. Heretofore strategy, the doing of
things not expected by the enemy, the execution of sectet movements for which he is not prepared, has been the very soul of military science. But with the advent of the "air scout," we are told, all this will be changed; every general will know just what his opponent is up to, the man with the big army will win.
It seems to me that this view of the matter overlooks some important possibilities. When the "air scout" becomes an accomplished fact, will not some inventive person devise an artificial fogmaker, a kind of bomb that will, in exploding, fill the air with smoke, so that the aerial spy will be foiled? Something of the sort will surely happen. A general about to execute a flank movement, or a concentration on to execute a flank movement, or a concentration on
some given point in the enemy's line, could make his preparations over night, and then, after having filled the upper air with smoke by means of balloons loaded with the smoke-producing mixture, deliver the blow as he designed it. And his foe would have no other way of ascertaining his intention than the good old method of observation and deduction.

In a recent story H. G. Wells depicts a fancied battle between a fleet of American battleships and a German air fleet, in which the Germans get the best of the fight by dropping bombs on top of the unlucky vessels. Now, the latest type of British cruiser, the "Indomitable," I understand, is without rigging. Why could a ship of war not be equipped with a bomb-proof, or at least a bomb-shedding, roof? This device would exat least a bomb-shedding, roof? This device would ex-
plode the deadly missile in the air, away from the vitals of the ship, and thus save her from destruction. Or perhaps the roof could assume the form of a network, which would be lighter, and would not catch the wind.

In fine, although the introduction of air scouts and bomb-dropping aeroplanes will complicate matters, I do not believe they will revolutionize warfare, as has been alleged. Possibility has always a few trumps up her capacious sleeve, which she can produce when needed.

Sydney C. Haley.
Eustis, Fla., September 12, 1908.
The Valtue of Inciined Propellers for Helicopters. To the Editor of the Scientific American:

I desire through your columns to bring to the attention of aeronauts an experiment which may possibly throw a little light on the problem of aerial navigation by means of the helicopter type of machine.
Experiment shows that the simplest form of helicopter, the propeller with flat inclined planes, cannot exert sufficient lifting force to raise the weight of the engine with any additional weight. Although the efficiency of the helfcopter can be very much increased by varying the shape of the planes, so far no form has been devised which gives any great promise of success.

The failure of the helicopter is due to the fact that a large proportion of the power of the engine is wasted in creating lateral air currents, which have no effect in raising the machine. That an engine can exert more than power enough to raise itself, if the power were effectively applied, has been demonstrated by Prof. Langley's inclined plane experiment, and Nature itself affords a demonstration in the flight of the bird, which, weight for weight, possesses only a small fraction of the energy of a well-constructed engine. The problem of flight by means of the helicopter is therefore as much a question of properly utilizing the power of the engine as of combining the greatest power with the smallest weight.

The experiment referred to, although performed with crude apparatus, illustrates this truth in a significant manner. Two propellers of equal size with flat inclined planes were revolved horizontally at the same rate of speed and their lifting force measured by a spring scale. The speed was then doubled and the lifting force again measured. It was found that the lifting force had only been increased by half. As the speed was still further increased, the proportionate increase in lifting power diminished, which indicated that as the speed increased the energy wasted in creating lateral currents increased. This is the secret of the failure of this form of helicopter.
The propellers were now inclined toward each other
at an angle of about 35 deg . and revolved at the same rate of speed. It was found that at lower speeds the lifting power was about the same as in the horizontal position, but at higher speeds it was very much greater. The significant fact of the experiment is that, with the propellers inclined, the lifting force increased at a greater rate than the speed, while the reverse was the case with the propellers in a horizontal position. The reason for this is that the air currents created by each propeller impinge upon the blades of the other and thus, by mutually increasing the resistance they encounter, enable them to exert a greater lifting force. The angle at which the propellers should be inclined for the greatest efficiency would of course be the angle that gives the greatest upward component of force.
If the principle illustrated in the above experiment were more fully recognized in the construction of the helicopter type of machine, better results might be attained.
H. T. Keating.

Columbus, Ohio, September 9, 1908.

## Thé New California Rified oil Pipe.

The $\$ 4,500,000$ rifled pipe line spanning the 282 miles from Bakersfield to Port Costa with its relay pumping station every twenty-three miles, its sixty men on duty along the route and its flow of between 17,000 and 20,000 barrels of thick, heavy oil past a given point every twenty-four hours, is now in operagiven

The construction of the pipe line was started just a year ago. The idea was the joint invention of John D. Isaacs, consulting engineer at Chicago of the Southern Pacific Company, and Buckner Speed.
The rifled pipe is a new scheme. It has been described at some length in the Scientific Americin. Into the interior surface of the pipe are cut corrugations about an eighth of an inch deep, and these run spirally round and round, making a complete circuit every ten feet. Into this rifled pipe from two separate engines are pumped nine parts of the heavy oil and one part of water. The water following the rifled indentures takes a swirling movement and forms a very thin sheet of lubricant about the oil, and the two move along together, the oil forming a dark central core that does not come into direct contact with tral core that does not come into direct contact with
the pipe. This avoids friction, which, with such oil, would prevent progress. It also saves the life of the pipe.
At each pumping station on this rifled-pipe line there are two 55,000 -barrel oil tanks and one 10,000 barrel water tank. The flowing oil and its surrounding sheet of water are received into one of the big duplicate tanks and then the water is drained off from the bottom and again taken up by a duplicate water pump and shot into the big pipe into which oil is being sent from a duplicate oil pumping engine.

## Smokeless Fuel.

According to the Mechanical Engineer a London man has recently patented the following process for the manufacture of smokeless fuel: About one-third part by weight of wet peat and two-thirds part by weight of bituminous coal, which may be in a finely divided state, are taken and placed in a retort and heated to a temperature sufficiently high (about 850 deg . Fah.) to drive off those hydrocarbons that produce smoke, the generation of the steam from the peat assisting in this operation. It will be understood that the temperature is not raised materially higher than is necessary to drive off the hydrocarbons as stated. The heat is applied for about five hours. The bituminous coal binds the peat together to a coherent mass and forms a fuel of high calorific value, which is readily ignited in a grate in the ordinary way and burns economically and without smoke.
In practice the retort may be provided with relief valves and arranged so as to maintain a pressure of 10 pounds per square inch. The retort may be heated in any convenient way, such as by heat externally applied or by burning some of the gases generated after partial purification.
The watery extract, containing tar of complex constitution, pyroligneous acid, and other products derived from the carbonization of peat, in addition to the gases referred to, is advantageously condensed and utilized for the production of a pitch of superior quality, and the usual condensable products obtained from the bituminous coal in the retort may be collected and used for any desired purpose. In some cases the contents of the retort after the process has been completed may, while still hot or after they have cooled, be dis charged into a solution of calcium chloride. By this means the smokeless fuel is rendered slightly deli quescent and always retains a certain quantity of moisture. , The coal or the peat or both may be moistened with a solution of calcium chloride before being placed in the retort.

Surface condensers require $11 / 2$ to 2 square feet of cooling surface per englne horse-power.

## THE PRICE OF WATER.

While we fully recognize the importance of water as an. indispensable condition of life, we seldom realize what quantities of it exist in our daily food, or what high prices we have to pay for it in the ordinary course of our purchases in shop or market. Take, for instance, the butcher's bill, which is usually the most serious item of domestic expenditure. It is a trifle disconcerting to be told that when the thrifty housewife expends money upon the best cuts of beef, no less than three-quarters of the sum is paid for water. Yet such is unduestionably the case-vouched for by the highest analytical authorities. Uncooked beef or mutton contains exactly 75 per cent (or three-fourths of its whole bulk) of water.
Other kinds of meat are less fluid in their nature. Lamb, for example, contains only 64 per cent of water. Pork has still less, the amount varying from 50 to 60 per cent. But those who buy smoked bacon really purchase the greatest amount of solid satisfaction for their money, for this meat sel dom contains more than 22 per cent of water.

In the fatty parts of food; hydrogen and oxygen do not exist in the chemical proportions necessary for the formation of water. Therefore, it may be laid down as a general rule that the more fat or oily the meat, the less water will it contain. This fact, the diminution of water as fat increases, is well exemplified in the case of poultry. The flesh of pigeons contains 75 per cent of water, that of fowls and ducks 70 per cent, while a fat goose may have as little as 38 per cent of water in its composition.

The flesh of different sorts of fish varies considerably in the quantity of water which it contains, the figures ranging between 40 and 80 per cent. Most of the kinds commonly seen upon the fish dealer's slab approximate to the higher rate. Thus, the flesh of eels contains 75 per cent of water; that of salmon and other red-fleshed varieties, about 77 per cent; while white fish, such as soles and turbots, reach one per cent higher still.
Milk must be regarded as the type of a complete food. Yet milk, fresh from the cow, and before it has paid a visit to the nearest pump or tap, contains between 86 and 88 per cent of water. This fact is exceedingly signiflcant of the importance which Nature attaches to water as a diluent of her food substances. But certain so-called solid foods contain even more water than the same weight of milk. This seems a paradoxical statement, yet it is perfectly true. Examples of the kind are especially common among our kitchen vegetables.
For instance, the turnip contains water to the extent of nearly 90 per cent, while very nearly the same proportion goes to the "make-up" of a cabbage. But it is a still greater surprise to learn that cucumbers, vegetable marrows, and pumpkins are only 5 per cent removed from water itself, chemically speaking. Nineteen-twentieths of this substance is water, suspended, as it were, in a frail network of solid matter. This brings to light the

The Solid Apple Contains 80 Per Apple Contains
Cent of Water.



Wheaten Hlour Contains Abont 12 Per Cent of Water.


Strawberries Contain 90 Per Cent of Water.
cal study. This fact is well shown in the case of fruit. Whereas the hard, dense-fleshed apple contains from 80 to 82 per cent of water, and the comparatively solid-looking strawberry 90 per cent, the most luscious grapes yield only 80 per cent of water when subjected to the analytical process.
Foods which contain only a small percentage of water are usually unfit for human consumption until they have been cooked. The culinary art, reduced to its simplest terms, consists mainly in innumerable devices for putting water to food in an attractive manner. Bread is a capital case in point. Dry wheaten flour contains, as a rule, about 12 per cent of water; and dry wheaten flour would be voted anything but a satisfactory article of food by the majority. Bread, on the other hand, is the acknowledged staff of life. In this, its changed form, the flour has received an addition of water until the percentage has risen to


A Lamb Chop May Be Consid- In a Cucumber 5 Per ered Fairly Solid Meat. It Cent of Solid Matter Contains 64 Per Cent of Water.


Pure Milk Contains 86 Per Cent of Water.
 Contains 95 Per Cent of Water.


In Converting Flour to Bread the Percentage of Water Is Increased to 45 or 50 . be desirable. Them.
days become somewhat limited in its possible applica-tion-to say the least. In the early days of dry-plate photography, the phrase was no doubt strictly true in its widest sense. But nowadays, as everyone knows, the camera can and does perpetrate on occasion the most flagrant falsehoods. Of course this is true, to an extent, in the case of ordinary photog raphy, when the artist is perfectly straightforward in his intentions, and merely desires to select the best point of view for his picture. In this way it may be said that almost any back yard or piece of waste land will yield a pretty but absolutely untruth ful "peep," if only the right spot for setting up the camera be chosen. All around may be grim and ugly, but by dint of a little judicious selection, a little clever "touching," and possibly with the aid of a "cloud negative," the photographer turns out a picture of real beauty.
But in this article it is the writer's intention to deal briefly with a more obvious phase of deceptive photography. Everyone knows something about "faked" photographs, and is aware that the depravity of the camera may often be turned to good ac count, and made to supply a number of pictures, both curious and beautiful, for the photographer's album Table-top photography, however, is quite a novel craze, to which few people as yet have paid much attention Indeed, it is quite on the cards that many of my readers may have heard nothing about it whatever A few words by way of introduction will therefore

Table-top photography may be justly described as an art; for no inconsiderable amount of skill and ingenuity must be called forth if the results are to repay the trouble which must be taken. Briefly, the

"A Scene in Switzerland."


Powdered Alum Arranged for the Snnrise Scene.

"A Mountain Lake." Note the Cloud Effect. The Lake Is a Plate of Glass.


A Winter Scene.


Tennis Ball Arranged for the "Young Moon" Photograph Below.


Photograph of the Young Moon.


Lnmps of Wax and a Paper Ship on a Looking Glass Make an Excellent Iceberg Scene.

"Sunrise on the Mountains."


The Mountain Top. The Clouds Are of Cotton Batting Hung Out of Focus.


An Alpine Peak Made of Coal Lumps Dusted with Alum to Produce Snow Effects.


Smoked Glass Supported by Boxes to Produce a ${ }^{6}$ Faked ${ }^{9}$ Lightning Flash Photo.


A ${ }^{6}$ Fake" Lightning Flash.


How the Camera and•Settings Are Arranged for Table-Top Photography.
idea is to obtain negatives of mimic scenery, etc., which has been previously built up from any materials that may. suggest themselves as suitable. The annexed photograph will give the reader some idea of the necessary preparations. At $A$ we have a movable background, upen which paper of different colors may be pinned at will, or masses of cotton wool, ac cording to the nature of the "sky effect" that may be required. The stage marked $B$ may be a table or upturned box-anything, in fact, that will provide a good steady platform upon which the scene may be arranged. The camera is sot up opposite to the stage, as shown; and it should be furnished with a lens of fairly wide angle. In addition to the above apparatus, it will be found desirable to have at one's disposal a couple of screens, which may be fixed up on one side or on both sides of the stage, for the purpose of shut ting out the light-a strong top light often being more effective than any other kind of illumination. Any odd pieces of stout card or board of the necessary size will be suitable for these screens.
A great advantage possessed by table-top photography is that it may be undertaken at any time-in dull, wet weather just as much as when the outdoor world is bright and smiling A fairly long exposure is always necessary; and as one can safeguard one's mimic landscap from the slightest movement, there is virtually no limit to the time during which the lens may be kept open. Certain kinds of table-top photographs may also be taken at night, by means of magnesium wire. A good "fake" of this kind is "The Young Moon," shown in the ac companying picture. Costly apparatus and a vast experience of matters celestial would be required to get a genuine picture of this kind. But by means of a black cloth, a white tennis ball, and an inch or two of magnesium wire, a striking result may be obtained. The deed should be accomplished at night in a quite dark room. Use the black cloth for background, and drape it over a small box, upon which the tennis ball is to be placed. While focusing, get a friend to hold a candle close to the ball. This will enable you to get the rim of the "moon". quite sharp. When all is ready, blow out the light, take the cap off the lens, and burn your strip of wire, holding it in such a position that the strong light falls full upon one side of the ball. The resulting picture will be very puzzling to all who are not in the secret of its manufacture.
Quite a number of effects may be obtained in a similar manner, this kind of table-top photography being specially applicable as a winter evening pastime Pile up a quantity of salt or alum to form peaks and ridges, drape a gray cloth to play the part of a "cloudy" background, and then make your exposure as before by means of magnesium wire. "A very pretty picture, "Sunrise on the Mountains," will result This kind of "fake" photegraphy may be carried to almost any extent with surprising success. A few blobs of candle wax, deftly manipulated and arranged upon a sheet of looking glass, supplies a realistic ice floe; while a vessel, cut out in dead black paper, and launched so that she rides above the reflection of a towering berg, adds vastly to the effect These are a few hints. The imagination of the reader will enable him to produce a score of varied and equally striking results.
To make an imitation lightning photograph first smoke densely a sheet of glass. This may be done most rapidly over the flame of an oil lamp, care being taken not to hold the glass so close to the flame as to crack it. Then, with the point of a sharp pencil, mark the track of the "lightning" upon the smoked surface, using as a copy, if you like, a genuine photograph of lightning. Now, by means of some boxes, prop up the glass so that a light behind it will shine through the transparent scratches. A candle placed behind the glass enables one to focus and then the exposure is made by burning a strip of magnesium wire. By setting the glass upon, and at right angles to, another sheet, good reflection, as though in the waters of the sea or a lake, is obtained.
Perhaps, however, the most fascinating kind of tabletop photography is that which is done by daylight As a typical example of how to set to work, the accompanying photograph of a "Scene in the Alps" may be taken. The mountains are specially selected pieces of coal. The snow is finely powdered alum. The sky or background is a rather dark piece of blue paper, chosen to produce a contrast with the sunow-capped mountain top. To increase the effect of height and vastness, the tiny figure, cut out of black paper, was set up upon the "snow" in the foreground. Result, a picture scarcely distinguishable at first glance from some which men have risked their lives to obtain.
Even the eternal snow, the brow of the lofty mountain summit, may be photographed in the study or sitting room. Some cotton batting; pressed to the re
quired shape between the hands, forms the basis Upon it powdered alum is sprinkled liberally. To supply the necessary effect of vastness a little black figure is added, his footsteps being traced in the snow by means of a pin point. The light streaming from a window near at hand casts a strong shadow under the mountain brow. The cloud effect is rendered by means of some pleces of batting, pinned upon the background, which has been specially moved "out of focus," in order to secure the necessary softness of the mimic mists.

When one once takes up table-top photography as a serious hobby, it is surprising how many little ornamental objects (such as are to be found in every house) may be pressed into temporary service. In the annexed photograph of a Swiss scene, the little châlet is a model that was purchased in Switzerland.


## The Indian Basket Trick

It rested upon a shelf for a number of years, and then suddenly found itself among its native snows once more, owing to the craze for table-top photography which had invaded the house! Only the "snow" proved to be powdered alum, while the rock upon which its foundations rested was a lump of coal! Still, the model châlet added much to the effectiveness of the picture.

In "A Winter Scene" also there is a little china statuette which has been promoted in imagination until it plays the part of a full-sized garden statue, half covered with a drift of snow. The leafless tree is just a moss-covered twig. In this way, by permitting one's imagination to rove, and by adapting anything and everything that seems at all likely to prove effective, an almost endless number of pretty and interesting table-top photographs may be established.

The accompanying photograph entitled "A Mountain Lake" is of especial interest because, after being taken, the print was enlarged to cover an area of 7 by 10 inches; and this without loss of effectiveness. Indeed, the resulting picture framed and hung upon a wall would probably deceive everyone to whom it was shown, unless it were subjected to an unusually close scrutiny. Yet the mountain and its lake are "arranged" exactly after the manner described above. 'I'he clouds are just cotton, the mountain and its neighboring rocks and hills are so many pieces of coal, while the "snow" is so much sprinkled alum


The Diving Duck Trick. hindo magic.
with a little white sand added to form the "shore" of the "lake." The lake is a sheet of glass having a strip of black cloth spread beneath it-a dodge, by the way, which is a decided improvement upon a looking glass, as a less brilliant and more natural reflection is obtainable by this means.
In conclusion, the writer commends the amplification of table-top photography to the reader, if perchance he is minded to try his hand at the pastime. The brief description which has been penned, together with the photographs which illustrate this article, should enable any amateur photographer soon to become proficient in the art.

The railways of Peru are run according to American ideas, and the rolling stock is according to American standard patterns, both as regards passenger coaches, freight cars, and locomotives.

## HINDU MAGIC.

Doubtless we have all heard of the tricks or feats of the Indian Hindu fakir; we have been accustomed to regard his powers as marvelous beyond compareas performing marvels that no mere Occidental can equal. He can, we are told, make trees grow from the ground or the deck of a boat; he can throw a rope into the air and, causing it to be suspended with out visible support, have his assistant climb up that rope, and his head and arms and legs falling to the ground, join themselves together, and finally form the original body and come up whole as at first! He can cause a stone to sink or swim at will, a boy to vanish from a basket, and a hundred other things, too marvelous to conceive. Let us examine some of these powers of the Indian fakir, and see how far they are
genuine, and how far they are the result of
trickery. We will first consider the famous mango tree trick. This has been the marvel of all oriental travelers from time immemorial, and the correct explanation of this trick has never been made public, to my knowledge.

The performer comes forward and proceeds to make a little mound of earth out of the soil and some water. This can be done anywhere, on the earth, on the deck of a ship, etc. The fakir usually wears next to no clothes, apparently making this trick-if it is a trick-all the more difficult. When the mound "of earth is complete, the fakir inserts his seed of the mang tree, and waters it to make it grow. He then covers it with a cloth, and, placing his hands beneath the cloth, proceeds to manipulate the seed for some time. In a few moments he withdraws his hands, and makes passes over the cloth, outside it. A wait; then the conjurer removes the cloth, and the seed is seen to have sprouted. Two tiny shoot appear above the surface of the ground. More passe are made, and when the cloth is removed for the sec ond time a tall mango tree is seen sprouting above the earth. This trick has probably mystified mor people than any one that the Hindu fakir performs It is accomplished in the following manner:
The seed that is placed in the earth is hollow, and within it is placed a branch of the mango tree, pre viously prepared and folded up. The leaves of the plant are specially adapted for the trick, and they are easily compressed into a small compass. The seed containing the mango shoot is placed beneath the earth, and when the conjurer places his hands under neath the cloth he works out a part of this folded-up branch, and leaves it sticking out. above the surface of the mold. This is repeated several times, until al the branch is showing above the mold, when quite respectable sized tree is seen to be sprouting. If the seed is examined before the trick is exhibited, the con jurer has previously exchanged the one examined fo the trick seed at some convenient moment before placing it in the ground.
Sometimes, the seed is seen to grow into gigantic proportions-into a regular tree, bearing fruit, in fact! It is probable that much of this is exaggeration pure and simple; but there is a manner of working the trick, or rather extending it, so that a very large tree can be produced at the conclusion It is this: The conjurer has the large tree con cealed beneath a thick cloth-a duplicate of the cloth he uses to cover the seed at first. Afte uncovering the seed several times, and showing it grown more and. more, he uncovers it for the last time, and, while the audience is gazing a the plant wonderingly, the conjurer takes occa sion to exchange the cloth for the one contain ing the big tree underneath it. Now, he quickly covers over the plant with this cloth, and when it is removed, there is the tree, full grown. It may be several feet in height. It was com ressed beneath the covering cloth. People do not think of asking to look under the cloth the last time, because they have often seen beneath it, and know it contains nothing They there fore assume that it contained nothing the last time the mold was covered over
Now we come to the famous basket trick, which has also mystified thousands, and yet is simplicity itself. A large oval basket is shown, something the same shape as an egg, laid on its side, and an opening cut in the upper surface or top. It is first shown empty. Then a small boy is shown, wearing a jacket and turban. He is placed in the basket, and the opening is covered over with a blanket. The basket is so small that the boy apparently fills the whole of the basket. What is the surprise of the spectators, then, to see the fakir suddenly leap into the opening of the basket, and proceed to stamp about as vigorously as he can-treading on the ground, and apparently showing that the boy has disappeared, and is no longer in the basket! To make assurance double sure, however, he snatches up a sword, and proceeds to run the basket through and through in all directions. No sound issues from the basket.

There is an ominous silence. Evidently the boy has disappeared. But the conjurer turns around and shouts, and the boy, wearing the same jacket and turban, is seen in a neighboring tree. He descends. A tom-tom is beaten, and after a few incantations, the basket is seen to stir, and soon the blanket heaves up, and is thrown aside, and the boy is seen standing before us, as sound as ever. This trick, like the last, can be performed in any locality, on the deck of a ship, etc., thus showing that trap-doors have nothing to do with the result. How is it done?
First, as to the basket. It will be seen, when we think it ower, that the peculiar shape of the basket renders it capable of being employed in the following manner: The small boy, as soon as he is placed in the basket, curls up, and wriggles his body, eelwise, around the edges of the basket. That is, he coils around the inner surface, just as a snake might coil up within it. Now it will be seen that it is possible for the conjurer to leap into the opening, stamp on the ground, etc., since the open space in which he treads is unoccupied by the boy's body. He steps in the middle of the circle of flesh. And when he runs the sword through the basket, he only runs it through those places where the boy's body is not concealed.
So much of the trick is plain: how about the disappearance and reappearance in the tree? There are two boys, dressed exactly alike. The first one never leaves the basket. He simply remains quiet until he receives the signal to show signs of life again. The second boy climbs up a neighboring tree at some convenient moment, and shouts when he sees it is the proper time to make his presence known. So much for the famous basket trick!

A very clever trick often seen is the following: It is known as the "dry sand trick." The fakir brings forward a pail which he proceeds to fill with water. He then shows some ordinary sand, quite dry. To prove its dryness, he takes up a handful, and blowing sharply upon it, scatters it in all directions. He then takes up another handful and drops it into the water. We can all see it lying in the bottom of the pail, under the water. Next, showing his hands empty, he places one in the pail, and brings out a handful of the sand. Blowing upon it, it still scatters in all directions-showing it to be as dry as ever. This is repeated several times, until all the sand is again extracted.

This is a very clever trick, and would never be discovered, unless its secret were told. It is performed in the following manner: Fine, clean sand is selected, washed carefully in hot water several times, and dried in the sun. Some of this sand is then placed in a frying pan with a lump of fresh lard and is cooked until all the lard is burned away. The result is that every particle of sand is covered with a thin coating of grease, so that when this sand is dropped into the water the sand is impervious to the water (owing to its coat), and so remains as dry as ever.

Another trick that Indian fakirs perform is known as the "colored sands trick." The conjurer eats several colored sands or sugars-blue, red, yellow, etc.and swallows them. Nevertheless he can, at the request of any of the spectators, immediately blow out of his mouth any one of the colored sugars desired or called for. This is repeated until all the colors are blown out in turn.
The conjurer really swallows the sugars, in the first case-to his detriment, be it said. But he has, concealed in his mouth, several little capsules, each containing one of the sugars of the same color as that eaten. These are concealed within the mouth, between the teeth and the cheek, in various positions around the mouth-in a certain order, which the conjurer knows, Now, when any color is called for, the conjurer simply works the capsule containing this color to the front of his mouth, breaks it with his teeth, and immediately blows out the sand. This is repeated until all the capsules are broken in turn.

A little trick sometimes shown is known as the "diving duck.". A bowl is shown empty, and then filled with water. In the water is now placed a small artificial duck. Upon command of the fakir, it dives quite naturally of its own accord; then it rises to the surface, and this is repeated several times. At the conclusion of the performance, the duck is taken out and handed to the spectators, who can examine it. No amount of examination vill reveal the secret, however. It is this: A fine silk thread passes up through a small hole in the bottom of the bowl, and when the conjurer places the duck in the water, he manàges to slip this thread around the duck. Now, he has only to pull this thread, when bowl is filled, and the duck dives. At the end of the performance, the thread is broken, and the duck may be examined as much as desired.


## machine for slicing bread.

Although the machine which is here illustrated has been specially designed for slicing bread, it may be used with equally good results for slicing vegetables


## A bread slicing machine

or any other articles capable of being cut with a knife The special advantages of this machine are that it is light-running, compact, and of simple construction, and that a draw-cutting action is continuously imparted to the knife while the machine is in operation. The action of the knife and the feed of the material to the knife is automatic, and capable of adjustment for cutting thick, medium, or thin slices.
In the accompanying engraving the knife is indicated at $A$. It is attached to a block $B$, mounted to slide on a bar which normally holds the knife in its upper position under tension of a spring. This bar is connected to a cam roller $C$, which engages a cam rib $D$ formed on the face of a gear wheel. Meshing with this gear wheel is a pinion $E$, to which is affixed a crank. A rod $F$ connects this crank with the carrier $B$. When the gears are turned, the crank causes the knife $A$ to be drawn back and forth, while at the same time the cam $D$ alternately depresses and releases the knife. The bread to be sliced is supported on a carriage, which is automatically fed under the knife after each stroke. The feed mechanism is operated by means of a connecting rod $G$, attached to the lever $H$, which rises and falls with the bar on which the carrier $B$ is mounted. When the rod $G$ is raised, the bar $J$ is lowered, and coming in contact with a pawl on the latch $K$, serves to swing the latter out of engagement with the ratchet teeth $L$ formed on a bar under the bread carriage. The latter is then drawn forward by a coil spring 0 , operating a drum on which is wound


SOME RECENT TOYS AND TRICKS.
a cord that connects with the rear end of the bread carriage. As soon as the latch $K$ disengages the raok, the bar $J$ slipping past the pawl releases the latch; and permits it to return under action of the spring $M$ and engage the next tooth $L$. There are three sets of bars formed with ratchet teeth and the teeth are of different lengths on the several bars so that by adjusting the latch to engage one or another set of teeth the slices will be cut correspondingly thick or thin. The bread is held in the carriage by means of prongs formed on the rear wall, as indicated at $N$. The forward end of the carrriage is supported on a roller $P$. While the bread is being sliced, the operator may hold it down on the carriage by pressing down on the spring plate $R$. The inventor of this slicing machine is Mr. Edward A. Seaburg, of Seattle, Wash.

## SOME RECENT TOYS AND TRICKS.

He learns best who is taught unawares, and hence when a toy illustrates a scientific principle, or serves as a means of instruction, its value is more than doubled. Most of the toys in the following collection are of the educational class. The boy who owns a geographical globe, such as illustrated in Fig. 1, will doubtless develop a great interest in geography and navigation. The globe is partly filled with water or oil, which supports a float. The latter carries a magnet with the poles touching the inner surface of the globe. On the face of the globe a small ship with an iron keel is placed. As the globe is turned about, the magnet is moved to different positions, and the ship, owing to magnetic attraction, is made to sail to different ports. The principal lines of navigation are marked on the globe, and the game is to move the globe so that the ship will sail along these lines.
The device shown in Fig. 2 is called a "sound motor.". It is adapted to be placed on the sounding board of a piano or other musical instrument, and when the instrument is played, the dial of the motor slowly rotates. The secret is shown in the cross-sectional view. The dial is pivoted on a central pin, and its periphery is supported by a series of bristles. The sound serves to vibrate the dial, and the intermittent flexing of the bristles causes the dial to turn on its axis.

In Fig. 3 we have a trick pipe, based on a wellknown scientific principle. The exhibitor produces a pipe, places a paper disk over the bowl, and putting the stem in his mouth, blows the disk off with a sudden puff. Then he hands the pipe to a friend, asking him to do likewise. Strange to say, the latter is unable to blow off the disk, and even when the pipe is turned over while he is blowing, the disk hugs the mouth of the bowl. The reason is that the air which is blown through the pipe, on reaching the disk spreads out in all directions in a thin sheet, and produces a partial vacuum under the disk, so that the latter is held to the pipe by the pressure on its outer surface. The opening in the bowl is of much smaller diameter than usual, and a central pin on the disk serves to hold the latter in proper position on the pipe. The pipe is provided with a secret passage in the wall of the bowl, and there is a hole in the stem, which may be turned to register with this passage. The exhibitor turns the stem so that when he blows, the air passes partly through the bowl and partly through this passage. Hence the disk is tipped up on one side, so that the partial vacuum is not formed, and the paper may readily be blown off. As a precaution, the secret passage is provided with a valve connected to a flexible sleeve placed on the outside of the bowl. The exhibitor, by flexing this sleeve, opens the valve. The advantage of this is that in case he should forget to turn the stem when handing the pipe to his friend, the valve will still prevent the latter from performing the trick.
Few people realize that a steel ball will freely roll around the end of a magnet pole, from which it may be pulled off only with the greatest difficulty. The property is utilized in Fig. 4. It consists of a blowpipe fitted with a magnetic needle at one end. A light top provided with a steel stem is suspended from the needle by magnetic attraction. On blowing through the pipe, the top is spun by the stream of air issuing from the pipe, but the rotation of the top does not cause the spindle to fall off the needle.

The trick cigar illustrated in Fig. 5 can hardly be classed as an educational toy. However, it is such a vast improvement upon the ordinary trick cigars, which explode when they are partly consumed, that we have included it in this list. Its operation hardly needs any explanation. A stiff wire spring with the ends tied together under tension is placed in the cigar. As the cigar is smoked the string is burned, and the spring flies open, much to the astonishment of the smoker, and yet without endangering his eyesight.

## TIRE FOR AUTOMOBILE WHEELS.

The accompanying engraving illustrates a novel double-cushioned tire construction, adapted to take the place of pneumatic tires now commonly employed. One of the special advantages of this construction is that it prevents the wheel from skidding. In addition to this, the tire is strong and elastic and not liable to


## TIRE FOR AUTOMOBILE WHEELS.

injury. The cross-sectional view illustrates the details of the invention. At $A$ is a steel band about $1 / 4$ inch thick and 3 inches wide, which is bolted to the wooden felly of the wheel. Mounted on this band is a rubber cushion $B$, an inch thick, which runs around the wheel. Over this cushion is a pair of bands $C$, which are separated from each other by a space of about $3 / 8$ of an inch. The rubber cushion is clamped between the upper and lower bands by means of bolts, as indicated in the drawing. These bolts are free to slide through the lower band when the cushion is compressed. To increase the cushioning effect, the rubber is formed with holes which extend throughout its length. The upper bands are provided with half-round shoes riveted thereto, as indicated at $D$. Fitted over these bands is the outer cushion $E$, of rubber, which is firmly held in place by means of wires $F$. The outer cushion of rubber is provided with a series of ridges $G$, which are preferably of $V$ shape. These serve the purpose of cleats to afford a greater tractive effect. The advantage of forming these ridges of a $V$ shape; instead of running them diagonally across the face of the tire, is that the two branches of the $V$ counteract each other, and prevent any tendency toward a lateral movement. With tires of this type chains are unnecessary, as the V's prevent skidding of the wheel. The inventor informs us that owing to the fact that air can circulate between the ridges, the wheel does not produce as much dust as the ordinary automobile wheel. For this reason he believes that the tire would be of value for use in parks or parkways, where there is considerable agitation against the dust raised by rapidly-moving vehicles. The inventor of this auto mobile wheel is Mr. Irving Snell, Little Falls, N. Y.

## AN AUTOMATIC GAS LIGHTER.

Pictured in the accompanying engraving is a gas lighter of portable type, in which a flame is created at

an adtomatic gas lighter. will by directing alcoholic vapors to a catalytic igniter. This is done in such a manner as to effectually prevent the possibility of an explosion or ignition of the vapor in the reservoir of the lighter. One of the figures shows a sectional view of the device. It consists of a tube $A$, provided at its lower end with an air bulb $B$, while at the upper end is a cap $C$, in which the catalytic igniter is suspended. The tube $A$ consists of two members which are connect ed by a coupling $B$. The lower end of the tube is closed by a plug $E$. At each side of the coupling $D$ the tube is stored with
absorbent material, saturated with alcohol. The bulb $B$ when compressed forces air into the tube and through the absorbent material, and the air becomes saturated with alcoholic vapor. The upper end of the tube $A$ is closed by a valve $G$, which opens against the tension of a spring when the alcoholic vapor is forced upward by operating the bulb. The vapor, passing through the valve $D$, comes into contact with a bunch of fine platinum wire, which possesses the property of becoming highly heated when exposed to gas. Thus, the gas is ignited and issues from the openings $J$ in the form of a flame. The valve $G$ closes as soon as the air and gas are forced past it, so that when the bulb $B$ expands, it is impossible to draw the flame down into the reservoir of alcohol, and thus an explosion or ignition in the reservoir is avoided. The inventor of this lighter is Lewis B. Prahar, 124 Pearl Street, Brooklyn, N. Y.

## ODDITIES IN INVENTION.

A Convenient Match Safe.-The match safe illustrated herewith is designed to deliver or discharge one match at a time into the hand of the operator. It consists of a box which may be opened at the top to permit of introducing matches into an interior receptacle. The bottom of the box is open, but is formed with cleats on which the receptacle rests. The latter is closed on each side and at the rear, and also has a slanting bottom wall. The front wal of the outer casing of the box proper is formed with a groove or recess of such size as to contain but one match. In operation the receptacle is moved upward, leaving one match, which rests in the recess, and the latter, as soon as it clears the bottom wall of the receptacle, falls into the operator's hand. On releasing the receptacle the latter falls to its normal position,


## A CONVENIENT MATCH SAFE.

and permits another match to enter the recess, whence it is discharged when the receptacle is next operated. Bracket Attachment for Beds.-A resident of Allegheny, Pa., has invented an attachment for supporting a crib or tray in close proximity to a bed. A vertical standard which is preferably hollow, is rotatably secured to the bed in a sleeve and a socket piece clamped to one of the head posts. An arm mounted on the standard carries a $U$-shaped frame, the side-arms of which are grooved. In these grooves a tray or slide may be fitted or a crib or bassinet may be supported


## BRACKET ATTACHMENT FOR BEDS

in the manner illustrated. Fitted into the hollow standard is a rod which may be secured thereto by a set-screw and which projects over the crib. This may serve to support a curtain. The advantage of this arrangement is that the crib may be drawn close to the bed whenever the baby requires attention without requiring the occupant of the bed to arise.

Rubber-Tired Rocking Chair.-A Western inventor has devised a pneumatic shoe or tread, which may be applied to the rockers of a chair, so as to render the motion of the chair easy and noiseless, and prevent creeping and damage to the floor and walls of the apartment, or to the furniture with which the rocker may come in contact. The shoes may be applied to the rockers irrespective of their width or form, and each shoe is formed with a bumper at the rear end, which during excessive backward movement of the chair will engage the floor, and thus prevent over-


## A RUBBER-TIRED ROCKING CHAIR.

turning. Would that all apartment houses were supplied with quiet rockers!
A Handy Wrench.-The wrench illustrated herewith is particularly adapted for removing nuts from axles, and is fitted with means for holding the nut to the wrench, so that it will not fall to the ground when unscrewed. The socket, which is adapted to receive the nut, is formed with a plate of resilient metal, which may be pressed against the nut to clamp it in the socket. The upper end of the plate is connected to a thumb screw that is screwed into a lug on the handle of the wrench. By turning this screw the plate is moved to the clamping position


## A HANDY WRENCH

To facilitate operating the wrench, the opposite end thereof is provided with a knob, swiveled to the handle of the wrench, and after the nut has been clamped in the socket, the wrench may be turned by grasping the knob in the fingers and revolving the wrench so as to unscrew the nut. The entire operation of removing the nut or applying it to the axle may thus be done without soiling the fingers, as it is unnecessary to touch the nut.
Combined Dish-pan and Drainer.-A useful household article has recently been invented which will facil itate the washing and draining of dishes. It consists of a dish-pan of greater length than its width and pre ferably formed with a rounded inclined wall at one end. Set into this pan, at the opposite end, is a dishdrainer formed with sheet metal walls and having a skeleton bottom. The drainer is arranged to fit snugly into the dish-pan so that it will be held therein by frictional engagement. The bottom of the drainer consists of a series of rods and cross-bars terminating


COMBINED DISH-PAN AND DRAINER.
at one end in a dish-support or bail. The dishes as they are washed in the forward end of the dish-pan are supported on edge on the rods, the first dish being leaned against the bail. Being supported in upright position the dishes will drain readily and while in the drainer boiling water may be poured upon them to rinse them. Since the drainer and dish-pan are combined in a single article the dish washer will be saved many unnecessary steps.

## RECENTLY PATENTED INVENTIONS.

 The patents described in this department American Patent Agency, 361 Broadway, New York, N. Y
## Electrical Devices.

ELECTRICAL HOIST.-G. Rasmus, New York; N. Y. The object is this case is to pro-
vide an electric hoist having an electric motor provided with a revoluble armature and a revoluble field, the latter being driven
from the armature and forming the hoistfrom the armature and forming the hoist-
ing drum, so that the apparatus takes up very little room, requires no brake mechanism and is exceedingly se
traveling cranes.

TELEPHONE-RECEIVER SUPPORT.-M. M. Kahn, Louisville, Ky. This invention illus trates a very simple and serviceable device for use in supporting a telephone receiver in proper position near the transmither so as to leave the ingenious series of connected members, the inner end being attachable to the arm of an nd a standard is provided the forms a seat for the receiver and the foot of convenient support.
ELECTRIC RAILROAD-SIGNAL. - T. C Chatham, III. The improvement is in the nature of a novel construction and arrangement of block signal systems and relates especial ly to that form of signal systems adapted
for electric railroads in which a continufor electric railroads in which a continu-
ous feed wire carrying an operating circuit ous feed wire carrying an operating circuit
of 650 volts is emploged. The invention conists in the construction and arrangement of trolled by the passage of the car.

## Of Interest to Farmers.

SEED-CLEANER.-J. H. Hempen, Alexandria, La. This invention is particularly useful in connection with apparatus for cleaning and freeing from foreign substances, cotton-seed, frees the seed from chaff and trash, as well as froes particles of forign matter or other im purities of higher specific gravity than the seed. It is automatic in action, and adjustable for use in: cleansing seeds or granular material, and in which impurities capable of magnetic
attraction are removed from the material by means of an electric magnet.
DRAFT DEVICE FOR PLOWS.-A. J Minor, Canton, S. D. The invention relates
to draft devices, and especially to such devices when used for drawing plows. More specifically, to draft mechanism of this kind which is constructed so as to enable the animals to be hitched to the plow out of alinement with the plowshare, a construction being provided which will continue in a straight line although the pulling force is applied at a laterally displaced point. The construction facilitates adjustment of the device to suit the pulling force.

Of General Interest
BOTTLLE-NECK AND CLOSURE THERE-FOR.-A. McCambridge, Williamstown, N. J. The purpose in this case is to provide details
of construction for a bottle neck and closure of construction for a bottle neck and closure
which are very simple, and that when assembled after the bottle has been filled, will permit the free out-pouring of the liquid contents
of the bottle but prevent refilling of the bottle.

CARD-HOLDER.-P. M. Matheson, San Juan, Porto Rico. The holder is used in af show windows, etc. The device is constructed of a single piece of wire by bending it to a
point point intermediate its length to provide a head, with the free ends of the wire brought
together and arranged side by side, one of together and arranged side by side, one of
which is formed with a pointed extremity to provide a pin, and the other bent upon itsel head to produce a hook for engaging and hold. head to produ
ing the card.
SHAVING-MUG.-T. D. McKown, Pittsburg, Ga. One of the objects of the invention is to provide a simple and inexpensive mug, in which serving to keep the soap suds from drying out when the mug is being used, and so constructed that the entire device can be easily and thoroughly cleaned.
RECEPTACLE-HOLDER.-C. C. LittLe, San ose, Cal. The holder is for use in holding especially constructed for the use of water color painters in outdoor sketching, and is adapted to be applied to the cross bar of an easel or other support in a manner to carry
the glass in an upright position. There is a the glass in an upright position. There is a
seat provided for the glass, and. means for embracing the body thereof when placed on the seat,
port.

## Hardware

WINDOW-LOCK.-L. G. Miller, New York, v. Y. The invention relates more particularly to that type of lock which includes a locking member secured to one sash, and a keeper or
casing on the other sash, adapted to engage casing on the other sash, adapted to engage
with one end of the locking member to retain
the two sashes in engagement with each oth
and prevent the window from being opened.

## Heating and Lighting

GAS-MANTLE SUPPORT.-C. J. BARTON Big Rapids, Mich. The so-called gas mantles attached to gas burners for intensifying the liable to be cracked or broken off when jarred or otherwise set suddenly in vibration. To
avoid this result, and thus prolong the "life" of such mantles, the inventor has devised an improved
burner.

## Household Utilities.

WRINGER.-D. A. SAWYERS, Unionville, owa. The invention is particularly useful in connection with devices used for wringing out
mops, wash-rags, and the like. An object is to provide
from place to support a receptacle having a frame adapte vided with means for such as a pail, and prorags, and the like.
table.-A. B. Phelan, Alliance, Neb. This nvention relates more particularly to improve ments in that type of table in which there is which may be uncovered by moving said top. The compartment may be employed for the storage of kitchen or table articles, or ma
if desired, be employed as a sink.
WaStépipe cleaner.-W. T. Lisenby, Longbeach, Cal. The invention is an improvement in waste pipe cleaners, having among means for instantly unchoking and cleansing waste pipes which become clogged with paper, grease, or other foreign substance. Means are provided whereby as the piston is reciprocated
any material which might become lodged in any material which might become lodged in
the pipes is positively forced out.

COMBINED CLOTHES AND CLOTHES-PIN receptacle.-W. H. Carpenter, Lehr, N. D . The receptacle is adapted to be carried
upon the person for use in hanging clothes upon or removing them from a line. The inventor's aim is to provide an inexpensive and
simple receptacle of separate compartments adapted to be hung by means of suitable straps from the shoulders of the user

## Machines and Mechanical Devices.

SELF-LUBRICATING SHAFT.-E
ood, Long Island City, N. Y. There is di culty in lubricating shafting revolving at high velocities, because centrifugal force repels the oil. Mr. Wood puts the oil inside. This has been before proposed but he has made imHe provides convenient and reliable means insuring a slow discharge under all conditions, with an increased rate of discharge when the shaft is revolved.
hÝdraulic Press.-T. E. Holmes, Oakdale Road, Nether Edge, Sheffield, England. presses and the like worked by means of steam hydraulic intensifier apparatus, and wherein the valves for controlling the admission and and lifting cylinders and for controlling the connections between the air vessel and the
high pressure hydraulic system are all conby a single handing lever
FRICTION-CLUTCH.-H. N, DAVIS, Independence, Mo. The object of the invention oo provide a clutch very effective and prac tically noiseless, and arranged to automatic ally connect the driving member with th member to be driven, as long as the driving
member rotates in a forward direction, and to immediately and automatically release the driven member as soon as the forward motion
of the driving member ceases or the driving member runs in a reverse direction.
AIR-LOCK FOR MINES AND TUNNELS. . H. Durack, El Paso, Tex. In carrying out being located near the mouth of the mine shaft or tunnel, and another being placed
contiguous to the heading or foot of the shaft contiguous to the heading or foot of the shaft
or tunnel; and two pipes are arranged in the shaft or tunnel, one for conducting fresh air into the same and the other for removing foul
air and water therefrom.
SOUND-REPRODUĆING MACHINE. - J. Schwan, New York, N. Y. The machine is con structed as a permanent part of a support hav the a flat top and in the nature of a table, and the top. The support is provided with a num ber of horns radiating to its border and connect with the horn of the machine, which serve uniformly distribute the sound waves
throughout the room. Thus the ordinary use of the support as a table is not impaired, and the machine, which is to many an unsightly ob-SELF-CONTROLLING DEVICE FOR NOTE Sheets.-H. Meyer, New York, N. Y. The object of the invention is to provide a device, more especially designed form speed by rotating the winding up roller at a speed decreasing in proportion as the sheet winds up on the
winding up roller, thus compensating for the winding up roller, thus compensating for the up roller.

PNEUMATIC ACTION.-H. MEYER, Ne ers, self-playing pianos, and like musical in struments, and its object is to provide a pneu-
matic action which is very compact, not liable matic action which is very compact, not liable
to get out of order, and arranged to allow convenient and minute adjustment of the valv rom the outside, to render the action exceed ingly sensitive
DOOR OPENER AND CLOSER.-P. D Galarnead and W. S. Nowton, East St. Louis
III. The construction of this device embodies line having two branches, one of wich is attached directly to the door and the othe passing to the door lock and connected there with in such a manner that when the line is
pulled the door if locked and closed will be unocked and then opened, or if the door b

## Prime Movers and Their Accessories.

Prime Movers and. Their Accissories. Wayrynen, Dolph, S. D. One of the objects this invention is the provision of means whereby the exhaust valve is automatically opened at the end of the exhaust stroke and held open by the escaping gas while
piston is completing its exhaust stroke. GAS-HNGINE IGNITER.-W. C. Planz, La Flores, Lower California, Mexico. This inven ion relates to improvements in ignition de vices for use in internal combustion engines and more particularly to that type of ignition
device in which a small portion of the exlosive charge is compressed in the ignition plosive charge is compressed in the ignition eously ignites and serves for igniting the main charge in the main engine cylinder.
Elastic-fluid BURNER.-W. F. Lees, . A. Lees, and C. W. Grise, San turbines the more particular object being to produce urbine operated by the expansive force of gases, such as are produced by the explosion
of heavy or light crude oil, petroleum refuse of heavy or light crude oil, petroleum refuse anthracite, and bituminous gases, water and
coal gases, benzine, gasolene, ethylene, marsh as, natural gas, acetylene gas, semi-water gas, producer
alcohol.

Rallways and Their Accessories. ADJUSTABLE EXHAUST FOR LOCOMO TIVES.-H. H. Mackey, Durand, Mich. In is the provision of a new and improved ad control the draft of the boiler, according t the work done at the time by the engine, s CAR-REPLACER.-W. M. Kitchen, Ha vana, Fla. In operation the derailed car is
moved forward until the flanges of the wheels moved forward until the flanges of the wheel engage the inclined faces of the integral
flanges. Continued movement of the car forces he wheels toward the rails, and as the flanges nropping friction rollers, they trip the wheels proper position. The plates are laid flat upon the ties, and engagement of the groove of one of two plates with the rail retains the other in place, and the latter is retained in place by
weight of derailed car, the flange of the first mentioned plate receiving the greater stress.

## Pertaining to Recreation.

TOY.-A. E. Woosnough, New York, N. Y gure toys, having movable members such a legs or arms, and its object is to provide a arranged to allow of turning any on the movable members independent of the解 ithin the body of the toy on turning any on the movable members.
fishing-float.-W. Von Rosenberg, Jr., the construction of a float, the attachment and etachment of which may be effected with grea acility; and further to improve the float, o ather its attaching means, to the end that hen the line is subjected to undue strain, a ine will not be subjected to a breaking strain the float, in response to its tendency $t$ assume a straight d
exerted on the line.
PUZZLE.-G. Chapman, Arlington, N. J The object in this instance is the provision of ertain defined course or path over which the body is to be moved, the body and path being who observes them only through the reflection of a mirror, whereby the natural order of thing reversed.

## Pertaining to Vehicles.

ROLLER.-J. M. Braly, Villapark, N. J. Th invention is particularly useful in connection with road and lawn rollers as well as rollers an inexpensive roller having a smooth and hard rolling surface, and so constructed that the height of the roller is suitably proportioned to the weight thereof, to render the device most efficient.
Note.-Copies of any of these patents will Please state the name of the patentee, title of


NTS TO CORRESPONDENTS.
Full hints to correspondents were printed at he head of this column in the issue of Aug
th, or will be sent by mail on request.
(10863) P. M. says: I am a highchool boy, and a friend of mine and I want construct a wireless telegraph. Our homes now if it would be possible to construct to $\begin{array}{ll}\text { at a reasonable cost. } & \text { 1. Would thunder- } \\ \text { storms cause any trouble } & \text { i. e., if lightning }\end{array}$ storms cause any trouble; i. e., if lightning
struck the pole what would happen? 2. About ow high would the poles have to be? 3. Have here been any articles in the Supplement raph? 4. Could you refer us to a few telebooks on the subject obtainable at a public ibrary? A. We can furnish you Supplement No. 1363, price ten cents, which contains a ull description of a set of wireless telegraph apparatus for sending one mile. A larger set
is described in Supplement No. 1605, with full structions for splemen and tuning a sta ion, in Supplement Nos. 1622, 1624, 1625, at ten cents each. These will give you the
principal points which you will require to ing, will course a thunder-storm, or lightgraph just what it will do to any other tall object which it strikes. The apparatus must e provided with a reliable lightning arrester. The aerial is always provided with a good ground. It is indispensable. Perhaps an aerial
18 feet above the house top will answer for a ile transmission. We would name good books or your study, Collins's "Wireless Telegraphy," price $\$ 3.00$; Collins's "Manual foregraphy,", price $\$ 1.50$. We shall be glad to furnish any all of these books upon order.
(10864) H. H. F. says: Having studed the question from all sides, I should like vertical open front engine on sidewheel steamers. According to several engineers on sidesed to good advantage by simply placing the machine across the beam of the ship instead of fore and aft, swinging the shaft a little ower and placing the cylinders well up in
the housing. It is a well-known fact that inclined engines wear on the underside of all it hard to keep them in good shape.' In using hard to keep them in good shape. In using with, and these advantages gained: Economy of space, compactness, even running and wearould be plarts, accessibility of parts, dynamos . We are ines with cylinders above the shaft would ect either of the first two or the last of the dvantages you claim for it in sidewheel reduced vibration) There might be conomy of hold space by having the cylinders vertical instead of inclined, but this would be at the expense of deck or cabin space. The larger the diameter of the paddle wheel the greater its leverage, and consego waterne, and lowering of the shaft would reduce this leverage. The principal objection to super-
mposed vertical cylinders, however, would be mposed vertical cylinders, however, would be
the raising of the center of gravity of the oat higher above the center of buoyancy, tendor inclined engines is with a view to keeping the center of gravity of the boat as low as possible to give increased stability. For this better to have them below than above the haft. Another objection to vertical cylinders a sidewheel steamer is the increased tendency to roll in a beam sea due to the alternate vertical thrust of the pistons on opposite In a fore-and-aft direction has no such tendency and only causes an uncomfortable vibration in over-engined boats
(10865) E. B. M. says: I, as well as everal friends, am obliged by our business to may possibly arise to use a revolver a need "heathen." Perhaps your valuable columns may settle a discussion which has arisen. 1. Which has the greater penetration and
muzzle velocity-one of the modern smoke-ess-powder automatic revolvers such as the Mauser or the Colt 32 - or 38 -caliber automatic, or a heavy "frontier" 44- or 45-caliber
revolver using black powder? A. The smallbore automatic pistols using high-explosive mechanism and have undoubtedly both higher penetration and muzzle velocity than the older and larger-bore weapons using black powder, mend us by all means to the latter, for the following reasons: If you wish to see how far into a boiler plate or how far up the
grain of a log of wood you can shoot, the grain of a $\log$ of wood you can shoot, the
small-bore, high-explosive weapon is preferable; if, again, you are sitting in a fort or other with which to pick off as large a number as
possible of men advancing to attack you across
half a mile of open country, use the colt or half a mile of open country, use the Colt or
Mauser repeating pistol by all means; you can use it from the shoulder with a detach able stock and do vastly more accurate long range shooting than you can begin to do with
any other pistol. But for more ordinary selfany other pistol. But for more ordinary self-
defense at close range, we should certainly prefer the older, larger-bore, slower-shooting pistol. 2. From the experience of army officers and frontiersmen, which of the types of
revolvers above mentioned is thought to have the greatest "stopping power"; i. e., suppos-
ing that a vital part was not struck, which ing that a vital part was not struck, which
arm would have the greatest disabling effect arm would have the greatest disabling effect?
A. As to "stopping power," it is not a ques. tion of "supposing a vital part were not
struck"; a vital part may be pierced by a strucll"; a vital part may be pierced stopping the aggressor sufficiently quickly. The being unable to find, in dense jungle, game which he felt sure had been mortally wounded, and the more convincing evidence of finding,
after great difficulty, animals which proved o have been shot through the heart or the brain, but which had had strength enough to hide themselves 100 feet or so away from
where they were hit in dense jungle before they dropped dead. These were shot with a high-penetration, at-trajectory, range anything up to three writer has done better target shooting than With any other, but which he gave up for bigan old converted military Snider . 550 en tirely on account of the higher stopping powe of the latter much older models which posof the former, and never after lost game which also narrowly escaped the charge of a rhino ceros which proved afterward to have been mortaly wounded by the small-bore gun, and
once received a nasty crack on the head from the kris of an "Amok" Malay (fortunately turned flatwise by a blow on the latter's up raised arm) after the "heathen" had been pierced through the heart, while still at least five yards from the writer by at least one
Mauser automatic pistol bullet. The best stopMauser automatic pistol bullet. - The best stop-
ping weapon we know of is a well-thrown heavy sheath knife, but to be effective it must it by an old side-partner, so as to insert about three inches of its blade through the ace of and as this requires a good deal of practice we recommend you in the meantime to use the
biggest-bore revolver you can get ; the slowest biggest-bore revolver you can get; the slowest-
burning black powder makes a ball travel burning black powder makes a ball travel
much faster than any man can rush at you, which is all you want. Use a double action
(self-cocking) revolver by all means, but be yond that point, without depreciating improvements in mechanism, we have never been able
to see the real advantage of automatic ejecto see the real advantage of automatic ejec-
tors, top breaks and similar devices beyond tors, top breaks and similar devices beyond
convenience when at target practice. When ou are in a really tight place and have used six cartridges, you won't have time to reload
anyhow, however quick your automatic ejector, anyhow, however quick your automatic ejector,
and you will have as much chance with the utt of a 20 -year-old Colt with about $71 / 2$ evolver with all the latest mechanical devices
(10866) D. E. W. says: Will you please tell me if it is a fact that there is a
total eclipse of the sun every 18 years and 10 days? A. Eclipses, solar and lunar alike occur in a period of 18 years and $111-3$ days,
very nearly. It will be $101-3$ days if there ery nearly. It will be 10 1-3 days if there
happen to have been five leap years in the happen to have been ive leap years in the
period. No one knows when this fact was
discovered, but it is certain that the Chaldeans discovered, but it is certain that the Chaldeans
knew it and predicted eclipses by its aid. About 70 eclipses occur in this period, varying somewhat because new eclipses come in at the
eastern limit and old ones disappear at the eastern limit and old ones disappear at the Saros. Of the 70 eclipses in a Saros, ther are usually 29 lunar and 41 solar eclipses
and of the 41 solar eclipses, 10 are usually total.
(10867) F. B. asks: Why do not the equal days and nights occur when the sun in one almanac calculated for latitude 40 deg.
N., on March 21 last the sun entered Aries and spring began, but the nearest equal day oc curred on March 18, three days before, while in ${ }^{\text {september the nearest equal day occurs on }}$
September 27 , four days after. A. Equal days and nights do occur every time the sun crosse the equator. The day is just twelve hours and
the night twelve hours long. But because the night twelve hours long. But because of
the equation of time the clock time of sunrise the equation of time the clock time of sunrise
and sunset varies from six. The true sun is east of the mean or clock sun by about seven
minutes in March and a little more than seven minutes to the west in September. See an good textbook of astronomy for a full ex
planation of this. Todd's, price $\$ 1.75$, planation of this. Todd's, price $\$ 1.75$, o
Young's "General Astronomy," price $\$ 3$, ar recommended and can be supplied by us.
What causes the synodic revolution of th What causes the synodic revolution of the
nodes of the moon, and why does the line of the moon's line of apsides and the regression of the nodes of the moon's orbit are caused by the disturbing action of the sun upon the
moon. The discussion of these effects constitutes the problem of the three bodies. A good elementary presentation of the problem
found in Young's "General Astronomy."
(10868) P. Y. asks: Suppose recording maximum and minimum pressure gage is
lowered below the disturbing influence of the waves, in the open sea, during a calm, wha ffect will the ebb and flow of the waves ha on the gages during a storm, the normal, or 20 feet from the crest to trough?
show th depth the change of pressure due to change of whether the depth changes because difference because of a change of depth of the gage if sensitive enough will indicate that fact.
(10869) G. R. M. asks: Please answer hrough your paper the following questions ncandescent lamp consumes $1 / 2$ ampere current per hour at 110 volts $=55$ watts. Does the same lamp operating on alternating current the same voltage consume an equal amount carrying alternating current heat if both are not placed in same iron- conduit or not con-
centrically wound? A. A 55 -watt 16 -candlecentrically wound? A. A 55-watt 16-candle-
power lamp uses 55 watts on any form of arrent on which it can be raised so as to ime, and 55 watt-hours per hour. Wires carrying any form of current are heated by the current, producing $0.24 C^{2} R t$ calories, in which $C$ is amperes, $R$ is ohms and $t$ is the time in seconds. This cannot be avoided by
any arrangement of the wires. It is the price calories which must be paid to get a cur t over a line.
(10870) P. H. K. writes: Is ice claims that it is salt. $B$ claims that it is imossible to have salted ice, as in the proces of freezing the salt is eliminated. Who is
right, A or B? A. When aqueous solutions reeze, the solids in solution tend to separate om the water, and the ice thus formed is pure or nearly so. It would not be easy to
form a block of uniformly salted ice. This s sometimes expressed by saying that water
rreezes itself pure, which is not a very correct manner of stating what takes place. The water freezes molecule by molecule, and the he unfroz inally a saturated solution. $\quad B$ has the bette of the argument
(10871) H. L. S. says: Will you please nform me how to connect up an electric bathf the electrodes to the metal, while the other is held in the hand. If of porcelain, connect
one electrode to a metal plate and place in the =
(10872) M. M. asks: 1. If lightning rikes in a body of water where a man is hundred yards of him? A. We do not know any reason why a person should be affected by ghtning striking the water in which he is
wimming. The earth is at zero is of infinite capacity, from which it follows hat no amount of electricity can raise the be shocked by it when he is immersed in it. The case is the same as that of a man buried in the ground or in a cellar under the ground.
No lightning stroke can harm him in either of hese positions. Of course a man's head pro ecting above the water might be struck, but his is not the condition which you suppose.
2. Which will break first, a rope 5 feet long r a rope 100 feet long, if it has the same trength pulling it? A. If two ropes, one feet long and the other 100 feet long, ar he ends only, the longer rope will break irst, since its weight is greater than that of
shorter rope, and is added to the pull the shorter rope, and is added to the pull
upon it. If the ropes were lying on the ground or other support, we do not think the difference in length would make any difference in breaking strength, although we
(10873) J. W. H. asks: Is there any ifference in the strength of a magnet with
$1 / 4$-inch core and one with a $1 / 8$-inch core if a $1 / 4$-inch core and one with a $1 / 8$-inch core
both are wound with the same amount
wire? Would it make any difference to t trength of a magnet having a $1 /$-inch core to have the core thinned down to $1 / 8$ inch at the bending point? The reason for doing this is o make it easier to bend after the magnet is
ound. A. The ease with which lines of mag. netic. force can pass through the core of an electromagnet is proportional to the sectional
area of the core. For this reason a core $1 / 4$ nch in diameter will transmit four times as any lines as a core $1 / 8$ inch in diameter, not advise the winding of an electromagne and bending the core after the winding. It is much better to wind the coils on spools which will slide over the iron core and put them in
place after the core has been bent into its place after
(10874) N. R. R. asks: Will you colder than manufactured ice or not? The latter is made at a temperature of 20 degrees above zero, and natural ice undergoes a tem-
perature sometimes many degrees colder. Does it retain this greater cold? A. All ice, natural
or artificial, in any place below the freezing
point will have the temperature of that place;
in any place above the freezing point it will
have the temperature of have the temperature of the freezing point
Ice does not retain its temperature below the Ice does not retain its temperature below the
freezing point. It cannot be heated above the freezing point, under ordinary circumstances.
Like any other solid, ice is cooled in the winter to the temperature of the air, be it zero or below, and becomes warmer as the
temperature rises till its melting point is reached. Then it cannot be made hotter.
changes its condition to the liquid form.
(10875) H. C. D. asks: Being a con stant reader of your valuable paper, I take the liberty of asking you to kindly inform me through your Notes and Queries column
whether the following statements which appear in the Encyclopædia Britannica (vol. xi,
pages 66 and 67 ) are correct. Under the head ng "Gravitation," paragraph 2, it says Movement of a Falling Body.-Our knowledge
of the force of gravitation being ultimately founded on observation and experiment it witi be convenient at this point to describe the ex f motion which a knowledge of the law tained. We shall first describe these experi ments, and then we shall discuss the laws $t$ which we are conducted by their aid.
ginner is apt to be surprised when he is told
that a heavy and a light body will fall to th ground in the same time if let drop from th same height. Yet nothing can be easier than
to prove this important fact experimentally Take a piece of cork in one hand and a bulle ne the other, and drop these two objects at will reach the ground together. Nor will the results be different if we try a stone and a various experiments to which we have re ferred suffice to establish the very important
result that the time occupied by a body in falling to the surface of the earth, if dropped mass of the body as well as ofendent of the of which the body is composed." I always un derstood it to be a well-known fact that the velocity of falling bodies depends upon the through which they pass, and I am therefor at a loss to understand the meaning of the
paragraph referred to. That the above paragraphs cannot possibly refer to bodies falling tence: "Take a piece of cork in one hand and jects at the same moment from the same height." A. The article which you quote from the Encyclopædia Britannica was written by
Prof. Ball, Astronomer Royal of Ireland a the time he wrote it. It is hardly likely that
he was in error on so simple a matter as the fall of a cork and a bullet from the hand to the ground. Have you tried it for yourself?
Had you done so, you could hardly have writHad you done so, you could hardly have writ-
ten the letter to us. The experiment is simple. So are others given by Prof. Ball. Try ter of the earth convinced that it is the ma its surface, and that the rate of fall is no dependent upon the weight or the density the body falling. This was demonstrated by Galileo at the Leaning Tower of Pisa befor
the immortal demonstration of the law o the immortal demonstration of the law o
gravitation by Newton. The paragraphs you gravitation by Newton. The paragraphs you
refer to have no dependence upon the other fact that the lightest and heaviest bodies fal thike in a vacuum. They refer to the fac
that all moderately heavy bodies fall prac tically alike through the air. Very light things are retarded enough by the air to have their
rate of fall changed by the resistance of the medium through which they are falling.
(10876) H. M. asks: 1. Why are the guns on battleships not larger than 45 caliber enough, or because an ordinary ship is unable the maximum length which can be use to advantage for the 12 -inch gun. The greate tate larger prove cumbersome, and necessi weight back of the trunnions. 2 By what formula is the displacement of ships known before they are launched? A. The displace cubical bulk of the ship below the waterline 3. Would it be possible tó build torpedo boat In the 400 tons with a speed of 45 knots? A possible to build a hull of 400 tons displace ment which would float horse-power necessary give a speed of 45 knots. The "Viper," torpedo boat of slightly over 400 tons, holds
the record for speed of slightly over 36 knots h hour. The horse-power increases as more weight of the engines to give a propeller thrus suitable for a speed of 45 knots would be the 21 -inch torpedo in use in the United State navy. A. The United States 21 -inch torped was described in the Scientific American o
January 6,1906 . b. A description of the 45 January 6, 1906. b. A description of the 45
centimeter torpedo in use in the German navy A. We are not aware that any data regarding
the German 45-centimeter torpedo have been made public. 5. Is there any work giving complete statistics of all rapid-fire guns in use in
the large navies? A. Brassey's Naval Annua gives full statistics. 6. Please put an article in your paper that treats of the new ship
now building in England, i. e., "Dreadnought," armored cruiser "Orion," T. B. destroyer
"Afridi," and the special type torpedo boat
that is intended to make 36 knots per hour.
A. The "Dreadnought" was illustrated and decribed in the issue of the Scientific Amerian of August 25, 1906. We have no data (10877) E. R. asks: Will you please tate in your query column how many revo-
utions the earth magkes in 365 days? A. The earth makes 366 revolutions on its axis in
365 solar days. One rotation of the earth 365 solar days. One rotation of the earth was due south last night is to-night in the ame position. Since the earth is also moving an orbit around the sun, the star seems to arlier each night than it did the previous ight. The earth must turn on its axis, about our minutes of time more to bring the sun to He same place day by day. This extra time onstitutes the difference in length between the solar and. the sidereal day, and in a year
causes that there shall be one sidereal day more than there are solar days. There are 365 solar days and 366 sidereal days in each of the rotation of the earth on its axis with reference to a star or to a fixed point in absote space.
(10878) H. B. C. asks: 1. Why is it at a light, when put into a 110 -volt circuit, f small copper wire of about the same length s the filament of the lamp, when placed in the same position, will immediately short ircuit? have found it to be a that when an incandescent light's globe breaks, the flament does the same as the piece of copper ire, provided, of course, that the current is hinking that the air has something to do with A. When the globe of an incandescent burned by the oxygen of the air just as any burned by the oxygen of the air just as any
ther piece of carbon would be. The current is not short-circuited by the filament. The hemical action of burning the filament, and not to any electrical action. When the circuit bridged by a short copper wire, the resist nce of the copper wire is small and a large ow of amperes takes place, which heats and melts and also burns the copper., This is may a small, practical 110 volt current How ric heater be made? Is not current elec wire the best for this purpose? A. If you want an electrical heater which may be atached to a lamp socket, wind about 200 to 220 ohms of fine German silver wire on porcelain UPPLEMENT 1112 price 10 cents, contains aluable data concerning electrical heaters. 3. What is the smallest size of wire allowed by building with 110 -volt current? sing what is known as No 14 rubere been or my outside, and No. 14 weather-proof for my inside wiring. In this am I meeting the equirements or not? A. No. 14 wire is allowed by the Underwriters to carry 12 amperes
in rubber insulation, and 16 amperes in other insulations. 4 Do wires necessarily need to be soldered in joining them to make them more electrically and mechanically perfect? A.
In good work wires are always soldered at In good work wires are always soldered at
unctions to other wires. No other connection iunctions
(10879) J. C. B. says: 1. In what probable way does Edison expect to utilize aba motive power? If ehine gas from it storage batteries? A. We regret to say that e are not able to answer your inquiry, "In hat probable way does Mr. Edison expect to
tilize cobalt?" etc. It would be a hazardous hing to attempt to tell what Mr. Edison will probably do, or may be expected to do. We
doubt if he tells any one, even if he knows doubt if he tells any one, even if he knows
himself, what he expects to do. We may say himself, what he expects to do. We may say
that there is no chlorine in cobalt, and no motive power in chlorine. We are sure that Mr. Edison does not expect to find either of these bellum days here in North Carolina, by rub bing a pocket knife blade across the points of the old flat strap iron on the railroad track, the blades of the knife so rubbed became highly magnetic, capable of lifting iron or steel obr larger perbaps elf, but after some forty years cannot say positively I raised anything heavier than a
fourpenny nail. Have tried the present T-iron rail repeatedly, with no magnetism resulting
at all. Why is this? The magnetic properies were then well known, but do not know if I can now establish the fact by another witnife by stroking it on a rail was due to the fact that the rail was a magnet. If the old
experiment cannot now be repeated, it is because the present rail is not a magnet. 3 . rom what source does the ocean derive its form strength? A. The salt now in the unihas been in the past ages washed out of the and or dissolved from beds of salt in the earth to which the water gained access. The
saltness remains, since all the water which evaporates from the ocean is fresh water. The original water was fresh. It became salt by dissolving salt from the earth. 4. Why are henventional number of guns (21) fired in
honor of the President of the United States?


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



## The Cluper Cup

Mux widw ix id


CLJPPER MFG. CO.,
SPECIAL TO AUTOMOBLLISTS:-

 CONSUMERS A UTO SUPPLY CO.
12.2-1254 Wabash Avenue, Chicago, ROTARY PUMPS AND ENGINES Pheir Oripin and Development.-An important series of
papers $\overline{\text { Viving }}$, bistorical resume of the rotary pump
and engine from 1588 and illustrated with papers
and enging from tristrican resume or illustrated with clear draw
ings showing the construction of various forms of
pumps and engines.
38 illustrations. Contained in pumps and engines, 38 illustrations. Contained i
SOPPLEENTS.1119, 1110,1111 Price 10 cent
each. For sale by Munn \& Co. and all newsdealers.

## The Perfection Wrench




GUNSMTITHS TOOL MAKERS, EXPERI MENTAL \& REE
WORK, ETC.


 1999 Ruys Sti.


The barker motor

 the leader of its class.
C. L. Barker, Norwalk, Conn.

## H0W <br> Manufacturers Can Increase <br> Their Business

Read carefully, every week, the
Classified Advertising Column in the

## 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
and not 13 for original in thirteen States? $\Lambda$.
The firing of ..1 guns as a salue for the na-
tional tlag. the lresident of this or other The firing of the Yuns as a salute for the na-
tional tlag, thent of this or other
countrics, or the sovereigns of forceign states, countries, or the sovereigns
is an international custom.
(10880) M. W. and C. P. write: We would like to know, through the columns of your valuable paper, how a boiler of
power, that is only in use about three months during a year, should be left. Should it be filled with water or empty, and should the
smokestack be protected? A. A boiler to be smokestack be protected? A. A boiler to be
laid up for a season should be thoroughly laid up for a season should be thoroughly
cleaned on the inside, filled with water with cleaned on the inside, filled with water with
steam on, so as to be full of hot water that as been boiled, up to the safety valve. The
fues and tire surface of the boiler should then fues and ire surface of the boiler should then ar pit, and put a cap close fire doors. With this treatment laid-up boilers do not rust
inside or outside. It is the moist air drawn inside or outside. It is the moist air drawn
through a laid-up boiler that does damage by
(10881) C. F. C. asks: 1. Are lantern slides (which are printed by contact) more
sensitive to the light than carbon velox? For sensitive to the light than carbon velox? For
instance, a plate that printed a good clear instance, a plate that printed a good clear
picture on carbon velox in 15 seconds, being held 12 inches from a large size house lamp, would a lantern slide take longer or shorter
time to print it? A. Lantern slide plates are alme to print it? A. Lantern slide plates are
always slow plates, much less sensitive than always slow plates, much less sensitive than
ordinary plates. A longer exposure is required. Mave you a Supplement telling
how to make lantern slides? A. We can send
you "Photo-Miniature Lantern Slides," price twenty-five cents, and Elmendorf's "How to Make and Color Lantern Slides," price $\$ 1$ by
mail. We can send you Supplement 483 , 517 , t24, 1062,1082 , on slide making, for ten cents
each. 3. Also, how to make a each. 3. Also, how to make a lantern slide
camera for making slides from $4 \times 5$ negatives? A. Supplement 625 tells how to make a bel
ows for a camera to take $4 \times 5$ negatives, and in Flmendorf's book there is a chapter on working with a camera in slide making. 4
Is there a magic lantern made which takes standard slides and burns oil for the light? Is this done, and are the pictures clear when
thrown on the screen? A. Yes. The pictures thrown on the screen? A. Yes. The pictures
cannot be enlarged more than four feet in diameter with oil lamps since the light become (10882) E.E.S.asks: 1.What is the best way to mount a map on a muslin backing nd would a window shade be suitable?
Moisten the muslin, stretch and tack it Moisten the muslin, stretch and tack it down apply the paste evenly over the entire back he edges of the paper. Now lay the sheet on the cloth and smooth it out and rub it down
upon the cloth so as to remove air bubbles and upon the cloth so as to remove air bubbles and
bring it into contact with the cloth. A rolle or squeegee such as is used for mounting photo graphs will enable you to do the job much be ter. 2. How can I produce on brass the bronze
like finish used on the instruments of sur like finish used on the instruments of sur
veyors and engineers? A. Bronzing of brass of effected by dipping in a sorchloride of iron to 1 pint of water, until the desired color is obtained; then wash in ho and alcohol varnish.

## NEW BOOKS, ETC.

The Building Meciianics' Ready Refer ence. Cement Workers' and Plaster ers' Edition. By H. G. Richey, Sup erintendent of Construction of U. S Public Buildings. New York: John
Wiley \& Sons.
16mo.; 458 pages $\begin{array}{cc}\text { Wiley \& Sons. } & \text { 16mo.; } 458 \text { pages, } \\ 193 \text { illustrations. } & \text { Price, } \$ 1.50 \text {. }\end{array}$ 193 illustrations. Price, $\$ 1.50$. Of the making of handbooks there is no
end, but their multiplication is hardly more rapid than that of highly speciand judge from the number of inquiries received, not only from builders' mechanics but from
architects and engineers, information on the lines of reinforced and other concrete work is less completely supplied than branches. This want Mr. Richey's latest work
seems to very adequately seems to very adequately supply; the mensura-
tion and miscellaneous tables are as complete as in the earlier editions for other builders' mechanics, those for transmutation from one system of measurement to another being ex
ceptionally so. The various hints and recipe and the rules for superintendence are most practical; and as regards tests, analyses, an
specifications for cements, we cannot think o specifications for cements, we cannot think of
any practical detail upon which we desire in formation which we cannot find in these pages That most essential feature of a useful hand
book, the index, has received proper attention and the illustrations are excellent, coated paper having been usedoraphic half-tones, the
reproduction of photograter remainder of the book being printed on thin paper to reduce bulk and keep it within dimen路

By on Hydroelectric Developments By Preston Player. New York: Mc Graw Publishing Company, 1908 16 mo. ; pp. 68. Price, $\$ 1$.
The present book deals with the commercia aspect of an industry in which investors, capi
talists, and bankers are talists, and bankers are much interested, a
schemes for the utilization of water schemes for the utilization of water power
are constantly coming to the fore. It is the are constantly coming to the fore. It is the
object of this short discussion to indicate


IN controversies as to rates, the policy of the American Telephone and Telegraph Company and its Associate Bell Companies has been to make a.complete and absolute showing of the condition, cost and value of plant, cost and value of service, cost and necessity of proper maintenance, and the broad position is taken tenance, and the broad position is taken that neither this company nor its asso-
ciated Bell companies have anything to conceal or anything to apologise for.

The capitalization of all the companies is conservative, far within justifiable limits, and in the relation between the replacement value of the properties and the capitalization of the companies, unique.

Fair rates, therefore, should be authorized or acquiesced in, for it is only by fair rates that good service to the public and permanent, healthy conditions can be created or maintained With a full knowledge of all surrounding circumstances and conditions, it is believed that this will be fully acqui esced in by the public.

Fair rates should and do insure highclass plant and equipment maintained at a high-state of efficiency, and provide fair wages to employes-the highest paid for similar class of employment Both of these are necessary to good service.

Fair rates should give fair return on the investment, and promise fair return on new money needed. This is necessary to maintain the interest of the existing shareholders in the proper administration of the business, as well as
o provide for the continually increas ing public demand.
Any revenue produced over and above such requirements and the proper reserve to provide for contingencies can be used for the benefit of the public, llowing the company to retain a part ufficient to stimulate the most efficient and economical management.
It would be difficult, if not impossi ble, to get effective and economical management, such as would produce the best results for both the public and the shareholders, without recognizing his principle.
It does not seem possible that there can be any question of the justice of this position. That being granted, the facts to be settled are:-

Is the management honest and competent?
What is the investment?
Is the property represented by that investment maintained at a high standard? What percentage of return does it show?

Is that a fair return?
Is it obtained by a reasonable distribution of gross charges?
If these questions are answered sat-isfactorily-and they are in the published reports of the offices of this company-there can be no basis for conflict between the company and the public, and the less the working conditions are made inflexible by legislative proscription, the better will be the solution of the constantly changing problems incident to maintaining the universal telephone service wisely demanded by the public.

## American Telephone \& Telegraph Company



ELECTRO MOTOR. SIMPLE, HOW TO




MUNN \& CO., 361 Broadway, New York


Palmer Motors




ONE RESPONSIBILITY ENGINE AND DYNAMO BOTH BUILTIN ONE FACTORY 10 K.w. TO 500 K.w. DIRECT CURRENT 15 TO 1500 H. P.

RIDCWAY DYNAMO \& ENGINE COMPANY

WHED도두N GASPOWERPLINTP
 Bituminous, Anthracite, Lig-
nite, Peat Charcoal or Coke. 40 to 200 H. P. units, for Mill, Satisfactory plants in all parts of
North America. Catalog No. 22 gives facts; ask for it. Horizontal Gasoline right; run right. Buyfrom the build save money. 25 years of success in every Engine. Weber Gas Engine Company, Bex 423 KANSAS CITY, MO.

SENSITIVE LABURATORY BALANCE By N. Monroe Hopkıns. This "built-up", laboratory




## EVEKY RIDER \& PROSPECTIVE BUYER



HOW TO MAKE AN ELECTRICAL




Convert Your Bicycle Into a Motor-Cycle
 ing for Bicycle, Auto, Marine
Stationary. Send stamp for catalo

## FIX MOTOLS

 cubio inches. To realize the impor


## A Home Made

 Alternating Current Motor$\mathrm{R}^{\mathrm{E}}$
The motor can be constructed by anyone of ordinary
skill in the use of tools, who has access to a screwcutting lathe with a swing of 9 inches or more. Cutting lathe with a
The motor is designed
6o-cycie, single-phase alternating current circuit,
now in widespread use for the lighting of dwell ings. The motor will drive a 16 -inch brass fan, a direct current for charging storage batteries, and in fact will do almost any kind of work that can be dealer or from
MUNN \& CO., 361 Broadway, Now York
far as possible the information which should
be obtained in order to afford a definite basis or forming a decision as to the merits of any proposed undertaking.
The Automobile Route Book. Compiled by D. H. Lewis. Automobile Route
Book Company, 1907. 12mo.; pp. 192. Price, $\$ 1.50$. The present volume deals with routes which start from Buffalo, N. Y., and is therefore par-
ticularly valuable for automobile enthusiasts ticularly valuable for automobile enthusiasts
that live in the western part of the State of New York. The maps are excellent. There
is also a list of automobile owners in Buffalo is also a list of
and nearby places
Cyanide Processes. By E. B. Wilson, E.M. New York: John Wiley \&
Sons, 1908 . 12 mo ; pp. 249 Price, Sons, 1908. $12 \mathrm{mo} . ;$ pp. 249. Price,
$\$ 1.50$. Owing to the recent improvements in cya-
nide practice, especially in the treatment of nide practice, especially in the treatment
slime, the author adds a chapter giving the
latest treatment, thus bringing the fourth latest treatment, thus bringing firse edition
dition up to date. Since the first the volume of literature on the subject of
cyaniding has increased twelve-fold (one-fold for each year), and while many theories have
been proved and disapproved, there remains been proved and disapproved, there remains
much to learn, although the process is an established metallurgical one. With the main facts, as outlined in this book, thoroughly di-
gested, the metallurgist need not work hapgested, the metallurgist need not work hap-
hazard, or the reader be mystified, and any investor must see an element of success in
this as in any other undertaking. The details of plant construction are purposely omitted, since they vary at each mill and must be
worked out by the engineer and performed by worked out by the engineer and performed by
masons, carpenters, and millwrights. The demasons, carpenters, and millwights.
tailed construction of machinery and appaatus is likewise omitted, as they are purchased rom mill supply houses ready made and from designs that have been tested. By dealing with
the subject in this manner a large mass the subject in this manner a large mass
generalities is eliminated from the text, the advantage of those seeking facts about House Painting, Glazing, Paper Hang ING, AND WiIITEWASHing. By Alvah
Horton Sabin, M.S. New York: John Wiley \& Sons, 1908. 12mo.; pp. 121. Price, $\$ 1$.
For every man, woman, and child in this every year; and the relative amount is in
creasing. Paint is a necessity; it is an econ creasing. Pa means of sanitation; it helps us
omy; it is a meat
to keep clean; it keeps us warm in winter and to keep clean; it keeps us warm in winter and
dry in summer; it brings light into dark cor ners; it beautifies our homes; it increases our
credit; it raises our assessments; the most credit; it raises our assessments; the most
ignorant enjoy its benefits; and the most profound that they have forgotten all they ever learned at college, retain its apprecia
tion versal in its appreciation, deserves attention-
indeed, merits intelligent study. The book tells simply and plainly the use of preservative coatings of one sort and another for the pro-
tection and ornament of common houses, as they are known, or should be, to every one o
the author's fellow-countrymen. An experi ence of many years in the manufacture an use of paints and varnishes and while on many points even experts disagree, the intention is
to set forth fairly sound and safe practice.
Consumption. By N. S. Davis, A.M. M.D. Philadelphia: F. A. Davis
Company, $1908 . \quad 12 \mathrm{mo}$.$\quad pp. \quad 172$. Price, \$1.
Although this book has been reprinted many
imes since it was first issued, it has not been evised until the present time. When it wa written the education of the public in regard
o the nature of pulmonary tuberculosis, its prevention and management was just begun
To-day everyone knows much of these subjects lhe need of an explanation of th ways of preventing it, and of guiding thos
who have it to recovery, is as great as eve Every chapter has been rewritten, and an ad Every chapter has been incorporated upon the
ditional one has been
advantages and character of treatment in advantages and character of
sanitaria and other institutions.
Electrical Contracting. By Louis J Auerbacher. New York: The Mc
Graw Publishing Company, 1908 12mo.; pp. 155 . Price, $\$ 2$. This volume was written for the wireman
and contractor with a view to giving him no only some practical hints on the latest con struction methods, but also to suggest to him
means for increasing his income. Many spe cial devices are described which will prove o great interest, such as a safety stop for a
motor, picture reflectors, etc. Wireless Telegraphy and Telephony Popularly Explained. By Walter
W. Massie and Charles R. Underhill. $\begin{array}{ll}\text { New York: } & \text { D. Van Nostrand Com } \\ \text { pany, 1908. } & 12 \mathrm{mo} \text {.; pp. 76. Price, } \$ 1\end{array}$ pany, 1908. 12mo.; pp. 76. Price, $\$ 1$ An objection to the majority of books on
wireless telegraphy, even though prepared for the layman or the younger students of wireless telegraphy, is that they begin with a history ous forms of induction methods of communicating through space, which are apt to corfuse the reader. This form of introduction is avoided
in the present work. The subject is dealt with in the present work. The subject is dealt wit

## Home-Made Experimental Apparatus

In addition to the following articles, the
Scientific American Supplement nnumerable papers of immensen has published
of which over 17,000 are listed in a calue,
orefuly prepared catalogue, which will be sent free of
clarge to any address. Copies of the Scientifo If then Supplement cost 10 cents each In there is any scientific, mechanical, or en-
gincering subject on which special information
is desired, some papers will be found in this
cital catalognene, some which it it
competent authority.
A few of the many valuable articles on the
making of experimental apparatus at home are ELECTRIC IIGHTING FOR AMATEURS. perimental installation can be set up at home.
Scientific American Supplement 1551. AN ELECTRIC CHIME AND HOW TT MAY
BE CONSTRUCTED AT HOME, is described in
Scientific American Supplement THE CONSTRUCTION OF AN ELECTRIC HOW TO MAKE A 100-MILE WIRELESS collins in Scientific American Supplement 1605. A SIMPLE TRANSFORMER FOR AMA-
TEUR USE is so plainly described in Scien.
tific American Supplement 1572 that anyone can
nake it. A $1 / 1 /$-H.-.P. ALTERNATING CURRENT DY.
NAMO.
Scientific American Supplement 1558 . THE CONSTRUCTION OF A SIMPLE PHO-
TOGRAPHIC AND MICROPHOTOGRAPHIC
APPARATUS is simply explained in Scientific APPARATUS is simply
American Supplement 1574
A SIMPLE CAMERA-SHUTTER MADE OUT
OF A PASTEBOARD BOX, PINS, AND A RUBBER BAND is the subject of an
Scientific American Supplement 1578 .
HOW TO MAKE AN AEROPLANE OR GLIDcan Supplement 1582 , with working drawings. EXPERIMENTS WITH A LAMP CHIMNEY. may serve to indicate the pressure in the in-
terior of a liquid; to explains the meaning of
capillary elevation and depression; to serve as a capillary elevation and depression; to serve as a
hydraulic tournique, an anpirator,
tent sind intermit-
tent sint to demonstrate the ascent of liquids in exhaustive tubes; to illustrate the phenomena
of the bursting hladder and of the expansive
force of gases. Scientific American Supplement
1583. HOW A TANGENT GALVANOMETER GAN
BE USED FOR MARING ELECTRICAL MEAS.
UREMENTS is described in Scientific American THE CONSTRUCTION OF AN INDEPENactual dimensions are published. Scientific
 Supplement 1618. A plunge battery of six cells,
a two-inch spark induction coil, a pair of one
pint Leyden jars, and an inductance coil, and all
the apparatus required, most of which can be
SIMPLE WIRELESS TELEGRAPH SYSTEMS
are described in
Scientific American Suppleare describe in 1363 and 1381 .
THE LOCATION AND ERECTION OF A 100
MIIE WIREIESS TELEGRAPH STATION
clearly explained, with the help of diagrams,
in Scientific American Supplement 1622 .
THE INSTALLATION AND ADJUSTMENT
OF A 100 MILE WIRELESS TELEGRAPH OUT.
FIT, illustrated with diagrams, Scientific AmeriOF A 100-MILE WIRE
FIT, illustrated with d
can Supplement 1623 .
THE MAKING AND THE USING OF A
WIRELESS
TELEGRAPH TUNING DEVICE
 Supplement 1624.
HOW TO MAKE A MAGIC LANTERN, Scien
tific American Supplement 1546 . THE CONSTRUCTION OF AN EDDY KITE.
Scientific American Supplement 1555. THE DEMAGNETIZATION OF A WATCH is HOW A CALORIC OR HOT AIR ENGINE
CAN BE MADE AT HOME is well explained,
 THE MAKING OF A RHEOSTAT is
in Scientific American Supplement 1594 Good articles on SMALL WATER MOTORS
ner contane in Scientific American Supplement
1494,1049 , How
How AN ELECTRIC OVEN CAN BE MADE
is explained in Scientific American Supplement
int
THE BUILDING OF A
is
described in Scientific
A SEWING-MACHINE MOTOR OF SIMPLE A WHEATSTONE
can Supplement 159
Good articles on INDUCTION CoILS are con-
tained in Scientific American Supplements 1514,
1522, and 1527 . Full details are 1522, and 1527. Fill details are given so that
the coils can readily be made by anyone. HOW TO MAKE A TELEPHONE is
A MODEL STEAM ENGINE is thoroughly de
scribed in Scientific Americun Supplement, 1527 HOW TO MAKE A THERMMOSAT is $\operatorname{ex}$
plained in Scientific American Supplements 1561, 1563 , and 1566 .
ANEROID BAROMETERS, Scientific American

## A WATER BATH, Scientific American Supple- ment 1464.

VA CHEAP LATHE UPON WHICH MUCH Each number of the Scientific American Sup
American Supplement 1562 . Each number of the Scientific American Sup.
plement costs 10 cents by mail.

## MUNN \& Co

raphy and telephony is made clear by slowing its analogy o commoner forms of apparatus are de-
The
scribed in a practical way. The book closes with a special article by Nicola Tesla on the uture of the wireless art, which might better The Plane Table and its Usi in Su veying. By W. $\quad$ H. Lovell. New
York: McGraw York: McGraw Publishing Com-
pany, $1908 . \quad 18 \mathrm{mo} . ;$ pp. 49 . Price, $\$ 1$. The plane table, one of the oldest of sur-
veying instruments, is in its simplest form veying instruments, is in its simplest form
merely a board for holding paper or other material upon which a map is drawn with the
aid of a rule or straight edge. Although a useful and serviceable instrument for railroad and land surveyors, it has never come into general use in the United States. This may be explained, however, by lack of knowledge
of the instrument, and its methods, as little has been written upon the subject. Of late years it has gradually become better known,
and the present little treatise will tend to and the present little treatise will tend to
assist in the diffusion of knowledge relative assist in the diffu
Tif: Railroad Signal Dictionary. An Which Designate American Terms Signals, Their Parts, Attachments, and Details of Construction. With Descriptions of Methods of Opera tion and Some Illustrations of British Signals and Practice. First Edition. Compiled for the Railway Sig nal Association. By Braman B. Adams and Rodney Hitt, Associate Editors of the Railroad Gazette. ing Committee: Mr. C. C. Anthony Assistant Signal Engineer, Pennsyl vania Railroad; Mr. Azel Ames, Jr. Signal Engineer, Electric Zone, New York Central and Hudson River
Railroad; Mr. J. C. Mock, Electrica Engineer, Detroit River Tunnel Com pany. New York and Chicago
Railroad Age Gazefte, 1908. Quarto;
3,127 illustrations; pp. 514.
The publishers of the present volume have previously issued a Car Builder's Dictionary
and a Locomotive Dictionary of great value, and were therefore well equipped for under
taking the present work, which is the result of a discussion by the Railway Signal Associa tion, the publication having been authorized by the Association. The present dictionary
constitutes a complete encyclopedia of the sig constitutes a complete encyclopedia of the sig
nal systems, the apparatus and devices in us nal systems, the apparatus and devices in use
in the United States, and affords a very detailed explanation and covers the complet field in a most satisfactory manner. While
primarily intended for signal engineers and primarily intended for signal engineers an
other railroad men directly connected witl other railroad men directly connected with
signaling, the volume should be welcomed by patent experts and draftsmen and technical writers. The illustrations and descriptions
cover manual block signaling apparatus, automatic block block_signaling apparatus, auto tenances, and electric and electro-pneumati and electro-gas apparatus for semaphore sig hals. The different track circuits are ver: clearly explained with diagrams of the track
and the wiring; block signals for electric trol and the wiring; block signats
leys are given, and the standard manual inter leys are given, and the standard manual inter
locking machines and power interlocking ma chines. The various signals employed are explained in connection with diagrams of track indicating the practice at yards, junctions,
terminals, and other situations, Different terminals, and other situations. Different
ways of working the block system are shown by diagrams. One of the authors, Mr. Adams. is especially well informed on all subjects re lating to railway signaling from its beginning,
while Mr. Hitt is an experienced technica while Mr. Hitt is an experienced technical
lexicographer, so that the work not only eluci dates the mechanical construction and actual operation of railway signaling, but affords an exceedingly desirable and authoritative terminology of the subject.

## INDEX OF INVENTIONS

## For which Letters Patent of the

## United States were Issued

for the Week Ending
September 22, 1908,

## And each bearing that dat

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



## 

## 






## ROTFNEILER

The Wrench with a Grip
ROTHWEILER
$\underset{\sim}{\text { WRENCH }}$ is dif-
T~ weich ait
It is lighter, more powerful,
has fewer parts and will last longer than any other pipe wrench on the market.
Made of th
Made of the best selected
tool steel.
Upper jaw, shank and handle forged in one piece.
Has a firm, sure grip and a quick release.
A wrench that you can de-
pend upon absolutely under any and all conditions.
Ask your dealer for the Roth-
weiler wrench and weiler wrench and insist upon
getting it.
Household size by prepaid express $\$ 2.00$.
I11ustrated Booklet mailed Free upon request Crescent Forgings Company 1203 Railroad St., Oakmont, Pa

 The Crank

The slightest "feel" of the crank
proves the perfection of MOBILOIL There is no possibility of anything bu perfect lubrication in any gasoline en-
gine, regardless of type. For different
mACUUM MOBILOIL
grade for your automobile-and why. A
copy will be sent free on request. It contains much of interest to motorists. MOBILOIL in barrels, and in cans
with patent pouring spout, is sold by all dealers. Manufar by VACUUM OIL COMPANY, Rochester, N. Y.

KEROSENE MARINE MOTORS


 899,037
899,234
8

899.238
899,459
890.295



4,899
899
899,
8899,235
899,064
899,018



89021021
son


Classified Advertisements
Advertising in this column is 75 cents a line．No less
than four nor more than ten lines accepted．Count
seven words to the line．All orders must be accom． request．
READ THIS COLUMN CAREFCLLY．－You will find inquiries for certain classe，of articles numbered
consecutive order．If you manufacture these goods
write us at once and we will send you the name and address of the party desiring the informatson．There is no charge for this service．In every case it is
necessary to give the number of the inquiry．
Wher necessary togive the number of the nituiry．
Where manufacturers do not respond promptly the
inquiry may be repeated．
MUNN \＆CO．

## BUSINESS OPPORTUNITIES

 A CORPORATION of highest standing having largewell equipped factiory and selling organization．and
ample capital．desires to manufacture and market me－ ample capital．desires to manufacture and market me－
chanical inventions of unauestioned merit．
pondenes．
ponder solicited．Address K．A．，Box 773，N．Y．City． Inquiry
light po．© $\mathbf{N}$ ． 611 ．

PATENTS FOR SALE．
 machuiry No．86．so．- W．anted to buy fle cutting
 sell outright or on roy
lowell，Harrison，Ohio．
Inquiry No．S66\％，－Wanted to buy needle，pin and
pell machinery． ELECTRIC WATT METER PREPA YMENT AT－
tachment．U．S．Patent
S73，356．Registers deposits：
 Inquiry No．868．5．－Wanted to buy $13 / 2$ to 2 －inch
No． 13 to 18 tempered sping steel． FOR LALE．Patent No．895．572．Artists＇workholder．
New，adius1abie for all artistsapliances and materials．
Make offer．J．C．Dana，Big Timber，Miont． Inquiry No．868\％．－Wanted to buy motor plows． FOR SALE，Safest，best and easiest draft manure
spreador Wris Wis without an apron．Address A．A．
Fokken，Raymond．South Dakotal Inquiry No． 8699 ．－Wanted to buy two－stranded
soldered wire for headies． U．S．PATENT．887．354 and Canadian Patent， 112.950 for
Automaticesaht Fantener．Have model reany to manu－
facture．Address S ．E．Sterrett，Paterson， N ．J．

## HELP WANTED．


operative Realty Co，Dept．J．B．Z，Washington，D．C．
Inquiry No． 8701 ．－Wanted to buy solar engines．

## TYPEWRITERS．

JUST A FEW LEFT．－Last cbance to secura a type－
writer at agents＇prices．Remington，Densmore，flick．
enser
 is used for structural work．

## REAL ESTATE

EXCELLENT LAND for factory sites for sale free－
hold or on lease at Stamford Linnolnshire，England．
Good railway facilite3 on Great Northern Railway sidings．water drainage and electric power available．
Apply Burghley Estate Office，Stamtord，England． Inquiry No．8835．－For parties making a still for
the purpose of extracting alcoliol from saw－dust．

## PHOTOGRAPHY

AMERICAN PHOTOGRAPHY．－A monthly maga－

 Inquiry No．88：sti．－For manufacturers of machin－
ery for making mateces，also machinery for making
purves and hand bags． purses and hand bags．

## MOTION PICTURES

THE MOVING PICTUUE WORLD．weekiy， 10 cents
per copy；yearly subscription，\＄2．The only paper de－
voted to the movins voted to the moving picture，
Inquiry fild．Moving Picture World，Box 450 ，N．Y．
In3\％．For manufacturers of machin－ Inquiry No．8737．－For manufacturers of machin－
ery for making toothirruses shaving brushes，gal－
vanized water buckets，locks，nibs and holders．

LISTS OF MANUFACTURERS COMPLETE LISTS of manufacturers in all lines sup－
pled at short notice at moderate rates．Small and
special lists compiled to order at various prices．Es－
 Inquiry No．Ny42．－For ma
still，also of thermomoter tubing．
 cards．A very valuable hist for circularizing，etc．
Price $\$ 15.00$ Address Munn \＆Co．，List Department，
Box 73 ，New York．

## lnquiry No．Sy46． board making macbines

Inquiry No．S748．－Wanted to buy polished or lac－
quered brass in sheets 29 gauge，quarter hard in temper． Inquiry No．8749．－－Hor makers of very arge
springs，used for running machinery． Inquiry No．s． 969 ．－For manufacturers of an ap．
pliance toattach to the old style razor blade to make
same a safety razor． Inquiry No．Ry才o．－For parties who make short
link twist chains，links from／ainch up，
 Luquiry No．8794．
Inquiry No．8yg．5．－Wanted to buy stock novelty
or jewelry catalogues． Inquiry No．s．N9\％．－For manufacturers of reapers， Inquiry No．8779－For parties manufacturing
gas，gasoline，stean engmes and boilers；；also packing
and mineral wool，steam supplies，iron and lead pine， gas，gasohne，steam engnes and boilers；also packing，
and mineral woo，steam supp iese，ron and lead pine，
power transmission machinery and steam fitters＇tools． Inquiry No．8780．－For parties who make gasoline
stoves．


 Inquiry No．8787．－For parties who manufacture
cat－gut． ＂Inquiry No．大890．．－F Inquiry No．\＆y！日．－For
glass holders made of glass． ＂Inquiry No．
Inquiry No．（79．5．－For a mechavical device for
$\begin{aligned} & \text { catching or destroyyng flies，mosquitus，etc．；also trap } \\ & \text { for catchink snakes．}\end{aligned}$
Inquiry No．8896．－For concerns manufacturing
stills adapted to the manufacure of denatured aicohol． Inquiry No．879\％．－For manufacturers of fiber． Inquiry No，X798．－For manufacturers of micro
ens used in small articles such as pencils．charms，ect Inquiry No．8799．－Wanted to buy new or second－
hand box nailing machine for small packing cases． Inquiry No．NSO
gard to pegamoid．
Inquiry No．S80．2．－Wanted to buy machinery for
cttones．
stond polishing Inquiry No．\＄803．－For manufacturers of files，
screws．druggists，suppiies，bardware in general，and
agricultural machinery． linquiry No．8804．－For parties dealing in wind－
mills，wood split pulleys，wheeibarrows，cutlery and
picks Inquiry No．N80．5．－Wanted to buy outits and
supplies for brazing． ing materials．
Inquiry No．S807．－For dealers in second－hand
cotton machinery．
Inquiry No．8co8．－For manufacturers of ma－
chinery for making bungs for barrels．
Inquiry No．\＄810．－－For makers or importers of
porous water bottles or jars to cool arinking water by Inquiry No．8811．－Wanted to buy electric tattoo－
ing needles，inks and stencils．
 －Inquiry No．8813．－For manufacturer of the $\underset{\text { Inquiry }}{\text { Inc．}} \mathbf{\text { No．}} \mathbf{8 8 1 4 .}$ ．
 Tnquiry No．881\％．－For a frm that forms small
articlesof wire，alsoa firmo to make wooden rings about
3or 4 inches in diameter．
 Inquiry No．8819．－For manufacturers of Excel
sior Welding Compound． Iuguiry No．©8．20．－Wanted to buy pressed Hber
boards 1 foot wide and from $1-18$ to $1 / 4$ inch thick． luquiry No．
making a rough composition board，something like a
straw board，
Inquiry No．sxeg．，－For manufacturers of dredg
ing machinery to be operated by gas engine． Tuquiry
paper and po． $\mathbf{N 8} 883$ ．－－For manufacturers of crepe Inquiry No．NCD4．－For a flrm to desipn and build
an automatic machine for making finger shields． $\underset{\text { device to }}{\text { Ypplit wood．}}$
Inquiry No．88：26．－Wanted to buy small fuel com
pression machines both manual and engine power． （Inquiry No．85：2\％－－For manufacturers of anneale
Inquiry No．8824，－Wanted to buy thin，highly
tempered steel for safety razors． Inquiry No．88\％9．－Wanted to buy machinery for
making pins，hair pins，hooks and eves． Inquiry No．©830．－Wa
making brushes and baskets．
Jnquiry No．8531．- Wanted to buy knitting ma
chines．
 Inquiry No．S833．－Warted to buy a peanut snell
ing machine． Inquiry No．X8：34．－Wanted to buy a 2 －horse－
nower gasoline engine for spray wagon working on Inquiry N $0.8835 .-$ Wanted to buy toothpick ma－
chinery Inguiry No．©836．－Wanted to buy decorticating
machines for sisal． Thariiry No．883\％．－Wanted to buy folding um
brellas． lnquiry No．A83S．－Wanted to buy metalhe tar
gets similar to clay birds used in snot－gun shooting． Inquiry No．S839．－Wanted to buy cheap auto
mobiles． Inquiry No． 8840.
carbon pressure lamps．
Inquirv No．SA41．－Wanted to buy lunch counte
and restaurant tixtures．
Inquiry No．884\％．－Wanted to buy annealed glass
Inquiry No． ing machine．～ Inquiry No．N84．5．－Wanted to buy mail orde
novelties，books，etc． Inquiry
butcher hand saw． 8846 ．－Wanted to buy an electric Inquiry No．8847．－Wanted laundry tubs． Inquiry No．S848．－Wanted to buy rust proof Inquiry No．8G49．－
makers of rifle sights．
Jnquiry No．NS．50．－Wanted to buy machinery for
making canvasglovesor mitts． Ynquiry No．N8．51．－Wanted to buy machine for
weaving wooden lath and wire together． Inquiry No．88：52－－Wanted to have made a con－
cave brass or copper refiector with focus of four or Ave Inquiry No．8853．－Wanted to buy wafer safety
razor blades．
 Inquiry No． 8855 ．－Wanted machine to punch
holes．fead and set atomatically solid copper rivet
and wish Inquiry No．8856．－Wanted a machine or grinde for reducing soft wood refuse to a tine dust．
Inquiry No．885\％．－Wanted addresses of shoe $\underset{\substack{\text { Inquiry No．S858．} \\ \text { maching．}}}{\text { Wanted to buy comb cleaning }}$


EIEER MoIII WARII

$8,89,11$
8
899,486
8,
89



## TIPPEWRITHERS M． Visible Writers

Prices $\$ 15.000$ Up



TYPEWRITERS



THAT DAINTY MINT COVERED CANDY COATED CHEWING GUM


SEALED PROPOSALS.




 MODELS $\underset{\text { Inventions developed. Special Machinery. }}{\text { EXP }}$ E. V. BAILLARD. 24 Frankiort Street. New York. PAREER, STEARNS\& C0.. 228 .229 South Street, New York



Experimental \& Model Work


## 

## $\overline{\text { BABBITT METALS.-SIX IMPORTANT }}$



## NOVELTIIS \& PATEDTED ARRTICLES

## MASON'S NEW PAT. WHIP HOISTS

Adepaexpense and liabillty incident to Elevatorg,


Magical Apparatus.
25e. Parlor rricks Catalogue, free.
MARTINKA \& Co.. Mfrs. 43 Sixtb Ave.. New Yort


INVENTORS


## LEARN WATCHMAKING

formeriy took years. Does way with tedipus apprerticeship. Moner earned while studying

His Duryea's Buggyaut

##  

## TRADE MARKS.





Clocks, AMerican Cuacoo ciock Co.........
Cocks.
co, ohio Brass and Iron Manufacturing



















## ABELS.

"All Nations' Brand," for coffee, Globe





 Sanitaring Han Hent," for hair nets, J. Kialm-
bach, Jr
 "Universoo," for cigars, schimidit \& Co.... PRINTS.
"Babibood Clothes,", for Infants' apparel
Windor-kint
"Ming




A printed copp of the specification and drawing

 iven. Adaress Munn co., be obained by, the in-
Yor.andian patents may now
Centors tor any of the inventions named



## Engineering News

The Leading Engineering Paper of the World. For Civil, Mechanical, Mining and Electrical Enginees 100 to 125 pages, $9^{\text {n }} \times 13^{\text {n }}$, weekly. Send ten cents for sample copy. The engineering news publishing co., 214 Broadway, New York

Just Published

## The New Agriculture

By T. BYARD COLLINS

12mo. 374 pages, 106 illustrations, cloth, price $\$ 2.00$

THIS new and authoritative work deals with the subject in a scientific way and from a new viewpoint. Dr. Collins has devoted his lifetime to the study of changing economic agricultural conditions. "Back to the soil" was never a more attractive proposition and never so worthy of being heeded as during these opening years of the twentieth century. Farm life to-day offers more inducements than at any previous period in the world's history, and it is calling millions from the desk. The reason for this is not at first obvious, and for this reason Dr. Collins has prepared the present work, which demonstrates conclusively the debt which agricul ture owes to modern science and the painstaking government and State officials. Much of the drudgery of the old farm life has been done away with by the use of improved methods, improved stock and varieties. All this tends to create wealth by increased value of the product and decreased cost of production. Irrigation, the new fertilization, the new transportation, the new creations, the new machinery, all come in for a share of attention. The illustrations are of special value, and are unique. All who are in any way interested in agriculture should obtain a copy of this most timely addition to the literature of agriculture. A full table of contents, as well as sample illustrations, will be sent on application.
MUNN \& CO., "setentilice Amerstenn," 361 Broadway, New York
 SPECIAL RUBBER GOODSOF: EVERY
DESCRIPTION AND CAN FURNISH ANY SPECIAL RUBBER.ARTICLE TO YOUR SATISFACTHN YOKKBELTING \& PACKING CO
91.93 CHAMBERS STREET. NEW YORK


## CENTER-FIRE

## SPARK PLUGS

The Racing Machine Plug. Gu anteed to add

10 Per Cent Power to engine. Fire charge in center of compression, causing perfect com$\$ 1.00$, or six for $\$ 5.00$. Regular price $\$ 1.75$ Cuaranteed. Give name of car and year.
Agents wanted. Write
general accumulator \& battery co. 128 Second St.. Milwaukee, Wis. GAS ENGINE DETALLS.-A VALUAbie and fully illustrated article on this subject is con-
ained in SOPPLEMENT No. 129.. Price 10 cents. For
sale by Munn \& Co. and ail newdealers.

## NATURAL COLORS



A Home=Made 100=Mile Wireless Telegraph Set



CRUDE ASBESTOS direct from mines PREPARED R. H. MARTIN, ASBESTOS FIBRE OFFICE.ST.PAUL BUILDING for Manutacturers use 220 B 'way, New York.


JAGER Marine 4-Cycle Engines


 281 Franklis. J. JAGER CO.

$$
\begin{aligned}
& 31 \text { Franklin, cor. Battery } \\
& \text { Boston, Mass. }
\end{aligned}
$$

$$
\begin{gathered}
\text { sostor. Batter) } \\
\text { Bass. }
\end{gathered}
$$

PLENTY OF RUNNING WATER
 Niagara Hydraulic Ram
 Towers. NILGARA HVDRALLIC ENGINE CO.
140. Nassau St., N. Y. Factory, Chester, Pa.


If you haven't read our page "ads" alogof the self-starting, six-cylinder
WINTON SIX 48 H.P. $\$ 3000$
60 H.P $\$ 4500$ Goes the route Goes the rout
like coasting


The Winton Motor Carriage Co.
ioSo berea road, cleveland, ohio


LANDOPENING: IRRIGABLE LANEDS IN THE FAMOUS PECOS VALLEY-PECOS COUNTY, TEXAS. Theselands may be e-tered in tracts of ten acrese or meltiples
thereof at $\$ 40$ per acre on terms of $\$ 16$ down and $\$ 8$ per month Hereof at $\$ 40$ per acre on terms of $\$ 16$ down and $\$ 8$ per mont
-nh interest-no taxes for five years, including perpetual water-
ight and proportionate ownership of the inh and proportionate ownership of the immense irrigatio
works, now building. Filings made without leaving home. works, now building, Filings made without leaving home.
The norient
rood now has
nowe
not eration between K Kansas City and the Pacifc Coast in Mexic
and will soon be in operation over its entire lengh and through and will soon be in ooperation over its entire lenth and throug
these lands which will hen command $\$ 100$ to $\$ 500$ per acre.
F cese lands which will then command $\$ 100$ to $\$ 50$ per acre.
For full information reararing these lands and the "Orient
road enclose four cents in stamps to the HOARD OF LAND COMMISSIONFRS
$\mathbf{7 5 1}$
Victor BIdg.


Robert For Peneral battery test ing Rober Peneral battury testing
Dead-Beat Acter Send for Catalogue
Volt-Ammeters




You USE GRINDSTONES?

 The CLEVELAND STONE CO 2d Floor. Wilshire. Cleveland. 0 .


