

style of glass art work is also carried on by the Libbey Glass Company. The engravers use copper disks of various diameters and thicknesses. The steel spindles carrying the disks are secured to a rapidly-rotating polishing head, the copper being charged with olive oil and emery powder. The tools are changed as often as necessary to obtain the desired effect. Both smooth and matt surfaces may be produced, or delightful combinations can be made of them. The cut glass industry certainly has a bright future in this country.

THE AUTOMOBILE AND MOTOR-BOAT RACES AT NICE AND MONTE CARLO.

BY THE SCIENTIFIC AMERICAN'S SPECIAL CORRESPONDENT.

Interest in the annual automobile speed trials at Nice was increased this year because of the motor-boat races in the Bay of Monaco, which were run off a few days later in connection with an exhibition of this new type of speedy craft.

The automobile speed trials were held on the first day of April, and were carried out without accident and with a considerable lowering of existing records. These trials took place on an extension of the Promenade des Anglais, and the road, while not so straight

going at a 95-mile-an-hour gait in an open automobile are graphically portrayed by Rigolly in the following words: "I felt I was traveling very fast—faster than at Ostend; but I was quite unable to judge the pace. I saw nothing of the road but a white ribbon which I did my best to follow in the middle. The only real sensation of my speed was the impression that my head was coming off—was being torn backward by a furious wind. I was in great need of a support, such as photographers employ." Asked if he could have maintained such speed for half an hour, he replied that the strain on his eyes and neck was so great that he did not believe anyone could keep up such a pace for 20 kilometers. Despite the fact that the machines, throwing up clouds of dust, all traversed this curving "ribbon" of road, whose surface had numerous small holes and hummocks, and which was lined on both sides with sightseers, not a single accident marred the events of the day.

These began with the mile speed trials from a standing start, which were opened at about 2:30 P. M., by a motor bicycle. Tamagni, on an Italian, 5-horse-power, twin-cylinder Marchand machine, won in 1 minute, 7 2-5 seconds, averaging a speed of 53 1/2 miles

motors only, and by machines of any motive power, respectively. The weight of the machines in both instances must not exceed 1,000 kilogrammes (2,204.6 pounds). A distance of 600 meters (656.4 yards) was allowed in which to get up speed for these flying kilometer trials. The one for the second Rothschild cup was won by Rigolly in 24 seconds, with Duray second in 26 3-5 seconds, and Mark Mahew third in 28 3-5 seconds. Three out of the four 80-horse-power Mercedes cars finished next in 29 2-5 seconds, the fourth covering the 6-10 of a mile in only 2-5 of a second longer time. Although the Mercedes cars were beaten, they nevertheless showed their great uniformity by making such an even performance.

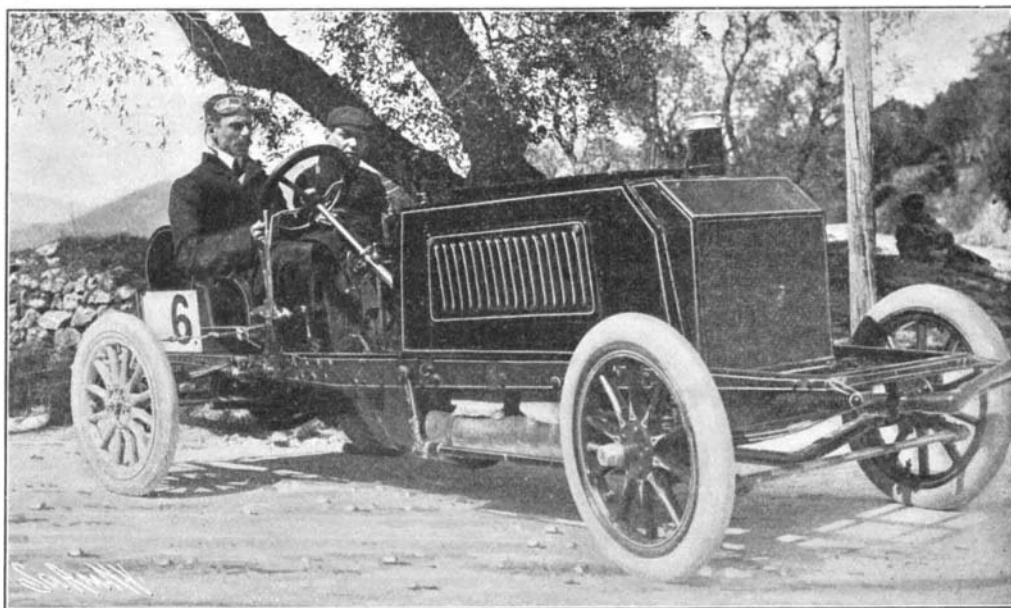
It was in the trials for the third Rothschild cup that Rigolly broke all records. Mark Mahew, on his Napier, flashed by first at 82.24 miles an hour. His time for the kilometer was 27 1-5 seconds. Hardly had the roar of his machine died away when sounds like those of a rapid-fire gun of large caliber were heard in the distance. One had barely time to guess what machine it was, when a huge racer with boat-shaped prow flashed by and was hid in a cloud of dust. The car jumped and bounded on the rather



The "Trefle-a-Quatre" at Full Speed.
She covered 124.2 miles in 5 hours, 16 minutes, 51 1/2 seconds.

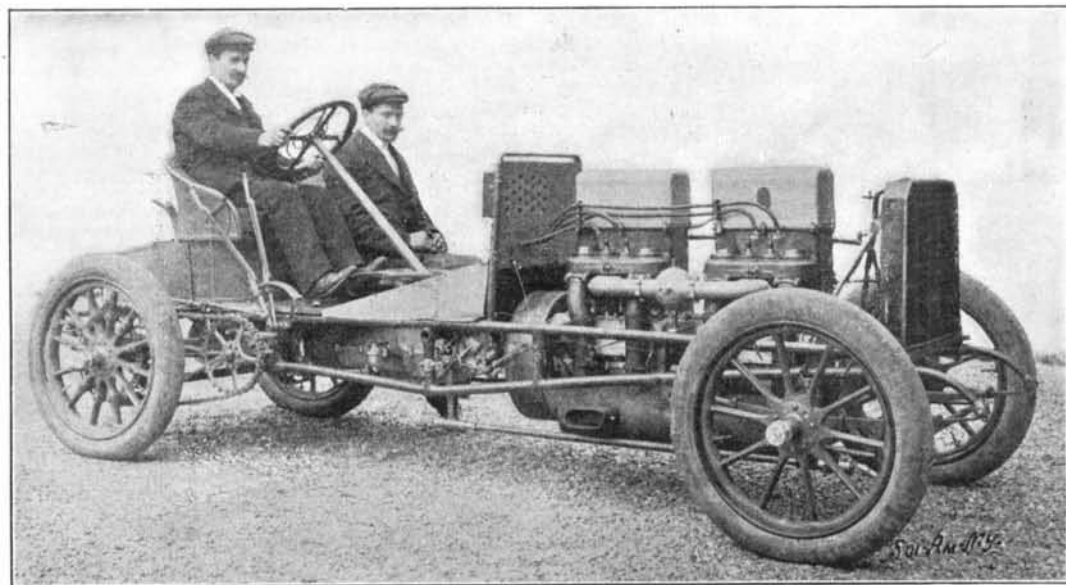


"La Rapee III." Winning the 93.15-Mile Race in 4 Hours, 30 Minutes, 22 1-5 Seconds.



Lieut.-Col. Mark Mahew on His 100-Horse-Power Napier Racer.

Record: One mile from a standing start in 1 minute, 3 seconds. One kilometer with a flying start in 27 1/5 seconds. (Third place.)



Rigolly on His 100-Horse-Power Gobron-Brillié Racer.

Record: One mile from a standing start in 53 3/5 seconds. One kilometer with a flying start in 23 3/5 seconds.



Werner on an 80-Horse-Power Mercedes Racer.

Record: One mile from a standing start in 57 4/5 seconds. (Third place.) One kilometer with a flying start in 29 1/5 seconds.

THE AUTOMOBILE SPEED TRIALS AND MOTOR-BOAT RACES AT NICE AND MONACO.

or smooth as the cement road of the Promenade, was not bad enough to prevent the breaking of records.

Last year the Serpollet steam racer swept all records away and won for the third time (and thus permanently) the original Rothschild cup for the flying kilometer, in 29.19 seconds. A new cup was immediately donated by Baron de Rothschild, and was won for the first time last year by Hieronymus on a Mercedes car in 31.66 seconds. This, the best time previously of a gasoline racer in the Nice speed trials for the flying kilometer, was cut this year to 23 3-5 seconds by Rigolly on a 100-horse-power (nominal) Gobron-Brillié car. This new time for the kilometer corresponds to a speed of 152.54 kilometers, or 94.70 miles, an hour, which is an increase of 24.37 miles an hour in the rate of speed over that attained last year by Hieronymus on the 60-horse-power Mercedes. When the fact is taken into consideration that this much faster speed was attained on a poorer road than that on which last year's records were made, one can readily see that there has been not only a considerable increase in the power of the machines, but also an increase in skill in guiding them. The sensations of

an hour. A 5-horse-power Griffon machine was second in 1 minute, 9 seconds. The previous world's record for this event was 1 minute, 13 4-5 seconds, held by a Griffon machine.

There were eight huge racing cars in the speed trials, two of which were 100-horse-power Gobron-Brillié machines; one, a new 100-horse-power Napier racer; and four, 80-horse-power Mercedes racers. The Gobron-Brillié cars won all the trials, and tied each other in the mile from a standing start, which they covered in 53 3-5 seconds. The older of these two machines, driven by Duray, is fitted with three speeds, while the new car, driven by Rigolly, has four. This gave Duray an advantage when there was but a short distance in which to start, or in starting from a standstill. Four Mercedes machines made the next best times to the Gobron-Brillié's in the mile from a standing start, the first of these, driven by Werner, making it in 57 4-5. Mark Mahew, on his Napier, was seventh in 1 minute, 3 seconds.

The great events of the trials were the flying kilometer tests for the second and third Rothschild cups, which can be competed for by machines with explosive

rough road in a most startling manner. But it was past before one could realize one's danger should anything go wrong. The spectators expected that a new record had been created, and cheered vociferously. Rigolly's machine covered the kilometer in 23 3-5 seconds, or at a 12 1/2-mile-an-hour faster rate of speed than that attained by the Napier. The other Gobron-Brillié was second in 25 1-5 seconds, and the times of the Mercedes machines were 29, 29 1-5, 29 3-5, 29 4-5, and 30 2-5 seconds respectively. The Mercedes, which we illustrate, driven by Werner, was fifth in 29 1-5 seconds.

The Gobron-Brillié machines have been manufactured in France for a number of years past, and a full description of them will be found in the SCIENTIFIC AMERICAN for December 28, 1901. Their great peculiarity is the employment of a double piston motor in which the explosion occurs between the two pistons, driving them apart. The four-cylinder motor used on the present car has eight pistons. The casings on top of the cylinders cover the piston rods and the connecting rods which extend down to the crank shaft. The positive fuel-feed device which has been used heretofore has, we understand, been now abandoned for an

automatic carbureter. The Gobron-Brillié motor was one of the first to be adapted to the use of alcohol for fuel. The motor on the record-breaking racer is said to develop in reality nearly 130 horse-power.

All three of the machines illustrated are prospective contestants in the Gordon Bennett Cup Race to be held in Germany in June.

The last event of the day was the third annual hill-climbing contest for the De Caters cup. This cup was first won by Serpollet in 1902, the contest being that year held over a kilometer course on the long Nice-La Turbie hill on the Corniche road, and Serpollet's time being 59 seconds. Last year the test was made over a like distance on Laffrey hill, and Rigolly, on the same Gobron-Brillié machine which Duray is driving this year, cut nine seconds off Serpollet's record. The test this year was over a 500-meter (547-yard) course on the Nice-La Turbie hill, which has an average gradient of about 10 per cent. Duray, on the three-speed machine that won last year, won again this time in 26 seconds, Rigolly, on the four-speed Gobron-Brillié, taking one second longer. Werner, on the 80-horse-power Mercedes, was fourth in 28 seconds. Another Mercedes came in fourth in 28 3-5 seconds, while the Napier racer took fifth place in exactly half a minute. Fletcher and Jenatzy, on Mercedes cars, made a dead heat in 30 1-5 seconds.

The motor-boat races, which were sailed over a hexa-

gonal course 12.5 kilometers (7.84 miles) in length in the Bay of Monaco, began on April 5 with a 150-kilometer (93.15-mile) race for the large, powerful racing boats less than 8 meters (26 1/4 feet) in length and having a total cylinder capacity less than 7.5 liters (457.66 cubic inches); and with a 60-kilometer (37 1/4-mile) race for the smaller cruising launches less than 6.5 meters (21.32 feet) long and with a cylinder capacity of less than 2.5 liters (152.55 cubic inches). A special traveling crane conveyed the boats from the exhibition space to the water's edge, and laid them upon a long incline running out into the water, down into which they were readily slid.

The 150-kilometer race was won in 4 1/2 hours, 22 1-5 seconds by "La Râpée III," a 7.98-meter (26.18-foot) boat built by Tellier and fitted with a Panhard & Levasor, four-cylinder, 35-horse-power motor having a cylinder capacity of 7.363 liters (449.30 cubic inches). The "Princess Elizabeth," which came in second in 5 hours, 18 minutes, and 4 seconds, is exactly the same type and length of boat, and is fitted with a four-cylinder Delahaye motor having a cylinder capacity of 7.443 liters (454.186 cubic inches).

Out of seven racers and six cruisers which started, only three of the former completed the race, while five of the latter succeeded in finishing. This shows that the ordinary launch with an engine of moderate horse-power is much more reliable than the light racing

shell propelled by a high-power motor and generally termed an automobile, or motor, boat.

The winner of the 200-kilometer (124.2-mile) race—the "Trêfle-à-Quatre"—as well as "La Râpée III," are shown in the photographs taken during the race. An idea of the fine lines of these boats can be had by noting the bow wave, which is so thin as to be quite transparent, the waterline of the boat being readily seen through it. The "Trêfle-à-Quatre" is fitted with a Georges Richard-Brazier four-cylinder motor. Its time for the 200 kilometers was 5 hours, 16 minutes, 51 3-5 seconds.

The motor-boat races were carried out successfully and with but one serious accident. This happened to the "Parisienne II," a very long racer equipped with three motors of about 70 horse-power each. This boat caught fire from a gasoline leak, and the gasoline in her tanks made a furious flame. The three men of the crew escaped by jumping overboard, and two of them were badly burned. As the boat had a steel hull, it was not destroyed, although the engines were ruined.

There are said to be 42,000 locomotives in this country, and of these about 3,200 are supplied with electric headlights, while 1,650 are equipped with acetylene generators. The remainder of these engines are making use of oil for the headlight illuminant.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

PRINTING-TELEGRAPH RECEIVER.—J. D. WHITE, 50 Clanciarde Gardens, London, England. The present receiver differs in various ways from a simple form of printing-telegraph receiver and one more complex described in two former patents granted to Mr. White. The mechanism is operated by an electro-mechanical device by which the rotation of the type-cylinder is effected by currents of one polarity sent along a single wire, while the other cylinder is operated by currents of the opposite polarity sent along the same wire; but the operation is not limited to this particular device. It may also be operated by any of the other electro-mechanical devices used in receivers to rotate type wheels and to effect printing.

RELAY-MAGNET.—W. PALMER, JR., Rincon, New Mexico. The object in this case is to provide a simple and practical relay-magnet of a kind designed to enable the current from a local battery to be directed at will through either one of two electromagnets by merely reversing the polarity of the current on the main line at a remote point.

MEGAPLEX RELAY.—R. A. ENGLER, Dubuque, Iowa. In Mr. Engler's invention the improvement relates to relays, and more particularly to a type of relay for increasing the effect of feeble currents—such for instance, as are employed in telephony. The structure is such as to increase the effect in various ways, and especially to permit several distinct devices to act cumulatively.

Hardware.

SASH-FASTENER.—J. A. LONG, Spokane, Wash. In this patent the invention relates to a device for securing the meeting-rails of an ordinary window-sash that operates in a vertical direction. One object is to provide an improved form of sash-fastener that will engage the under face of the upper-sash rail and not be dependent upon the means of securing one portion of the sash-fastener to said rail. Another, to provide an improved form of device that will securely hold the rails together and prevent unauthorized operation of the window-sash.

WIRE-FENCE TOOL.—J. A. MILLER, Avondale Col. In the present case the invention pertains to tools employed in the erection and repair of wire fences, and has for its object to provide a tool of that character having details of construction that adapt it for efficient service as a wire-stretcher and a staple-pulling implement.

LEVEL, PLUMB, AND INCLINOMETER.—J. HAPPEL, Cleveland, N. Y. The purpose in this instance is to provide details of construction for a device which adapts it for convenient and reliable service to determine if an object or surface that may be fixed or movable is plumb, level or inclined, and define the degree of inclination or deviation from a perpendicular or horizontal plane.

SASH-LOCK.—C. W. RANDALL, Lockport, N. Y. In this lock the object in view is to provide a device which may be applied to one of the meeting-rails of a pair of sashes, said device serving to hold the sash or sashes in adjudged positions for preventing rattling thereof under the pressure of wind, the device being readily adjustable to sashes of different thicknesses in order that it may be used generally on different sizes and styles of sashes.

Household Utilities.

SAD-IRON.—M. JOYCE, Salt Lake City, Utah. To enable this iron to compete commercially with cheaper irons, the inventor casts the body in one integral piece, with guide-lugs projecting upward therefrom, and provides a wooden handle with a metallic connection-plate adapted to lie between the lugs of the iron-body and

separated from the handle by a non-conducting shield, said plate having a stop-bar and a spring-dog connected with a headed pin or screw fastened on the upper side of the iron-body. The invention relates to irons of the type disclosed in two prior patents granted Mr. Joyce.

BED-COVERING.—E. W. BROWN, New York, N. Y. Mr. Brown's invention relates to coverings for beds, couches, cribs, and cots. His improvements enable the bed-clothing to be fastened in place easily and quickly so that the covering cannot be "kicked off," thus affording protection to the sleeper. Covering may be suspended in elevated position and in a way form a drapery, which depends from the suspended covering to the sides and foot end of the bed, thus keeping from coming in contact with the person, while protecting from drafts.

Of General Interest.

SELF-LOCKING TACKLE-BLOCK.—J. O. WALTON, Boston, Mass. The present invention consists in a simple guard combined with or formed on the block on its rear side just behind the cramping-pulley, so that the run of this part of the rope will be thrown laterally away from the cramping-face on the rear side, but will not interfere with the locking of the rope on the front side. A self-locking pulley-block has been shown and described in a former patent granted to Capt. Walton.

WINDOW-CLEANER.—J. C. G. FRITZ, New York, N. Y. The object of the invention is to provide a window-cleaner more especially designed for use on windows of locomotive-cabs, platform-windows of street-cars, and other vehicles and arranged to permit the engineer, motorman, driver, or other person to keep the outlook-window perfectly clear from frost, moisture, dirt, and the like and permit at all times a clear view of the path in front of the vehicle to avoid collisions.

NON-REFILLABLE BOTTLE.—W. C. BEAL, Fernandina, Fla. In this patent the improvement refers to a class of liquid-packages that are provided with means to expose or prevent the reuse of the receptacle after the contents have been removed, and has for its object to provide novel details of construction for a bottle and its closure which will effectively prevent the refilling of the bottle after the contents have been partially or wholly decanted.

GARMENT-SUPPORTER FOR MEN.—W. A. WRIGHT, New York, N. Y. The purpose in this case is to provide a form of garment-supporter especially adapted for use in connection with trousers and so constructed that it will include a button or stud to receive a suspender-end, a member for supporting engagement with a pair of trousers, a member, if so desired, adapted to prevent the upward movement of a belt, and a member whereby to apply the device to the inner face of the trousers waist-band.

STEERING AND STEADYING MECHANISM FOR BOATS.—W. H. YOUNG, Troy, N. Y. In this patent the invention has reference to improvements in steering and steadying mechanism for marine vessels, the object in view being the provision of a simple means whereby the boat may be easily steered and also prevented to a great extent from rocking and pitching.

CIGARETTE OR CIGAR BOX.—A. G. PSIANKI, New York, N. Y. The present invention has reference to improvements in cigarette or cigar boxes of the kind in which cigarettes or cigars are originally packed for sale; and an object is to provide a box of novel construction and having a receptacle for holding matches furnished with each package.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in 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 information. In every case it is necessary to give the number of the inquiry.

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Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 5438.—For makers of armatura core punchings in sheet metal, of the ring type.

AUTOS.—Duryea Power Co., Reading, Pa.

Inquiry No. 5439.—For clocks for a factory which are electrically controlled from one master clock.

For hoisting engines. J. S. Mundy, Newark, N. J.

Inquiry No. 5440.—For the makers of the "Merritt" typewriter, or dealers in repair parts therefor.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 5441.—For parties engaged in the manufacture or designing of clock cases.

Handle & Spoke Mch. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 5442.—For manufacturers of light wooden and metal specialties.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 5443.—For manufacturers of vulcanized fiber specialties.

American inventions negotiated in Europe. Wenzel & Hamburger, Equitable Building, Berlin, Germany.

Inquiry No. 5444.—For manufacturers of machines for turning and boring hub blocks.

Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway New York. Free on application.

Inquiry No. 5445.—For manufacturers of balloons.

Fine machine work of all kinds. Electrical instruments a specialty. Models built to order. Page Machine Co., 812 Greenwich Street, New York.

Inquiry No. 5446.—For woodworking machines for such work as dowels, skewers, etc.

The largest manufacturer in the world of merry-go-rounds, shooting galleries and hand organs. For prices and terms write to C. W. Parker, Abilene, Kan.

Inquiry No. 5447.—For manufacturers of heavy corded webbing.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 5448.—For machinery for making earthenware water pipes.

In buying or selling patents money may be saved and time gained by writing Chas. A. Scott, 340 Cutler Building, Rochester, New York.

Highest references.

Inquiry No. 5449.—For the address of the Furber Patent Shoe Company.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machinery and tools. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 5450.—For the address of the U. S. Silver Co., also of the Crown Silver Co.

Patentable, combined working machine for sale. For cabinet makers, machinists, amateurs. Has capacity of 12 different apparatus. Foot power. Also a working bench to match. All rights to buyer. Sold separately or together. Buddig, Eustis, Neb.

Inquiry No. 5451.—For manufacturers of machinery for making tooth brushes.

FOR SALE.—35 H. P. Berger Gas Engine. A splendid engine at a bargain. Burrell & Morgan, Elkhart, Ind.

Inquiry No. 5452.—For the address of the Pyle National Electric Headlight Co.

FOR SALE.—Home and foreign patent rights covering Combination Pastry Knife. Comprises five utilities. Cost 3 cents to manufacture. Adapted to mail order custom. F. A. Tobler, Bisbee, Arizona.

Inquiry No. 5453.—For makers of a bow-bar-filing equipment.

Inquiry No. 5454.—For dealers in sulphuric acid in tank cars in quantities.

Inquiry No. 5455.—For a small ice machine, which is not expensive, and which is really suitable for family use.

Inquiry No. 5456.—For the address of Geo. W. Shaw, manufacturer of wooden mantels, coal and gas grates.

Inquiry No. 5457.—For an electrical device by means of which the number of feet of water in a reservoir or tank can be ascertained at a distance of 4 or 5 miles.

Inquiry No. 5458.—For manufacturers of stamped steel ceilings.

Inquiry No. 5459.—For machines for making paper boxes and cartons.



HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(9378) H. L. J. says: I was recently shown an optical illusion which puzzles me. A chicken feather was placed near my eye, and looking through it at my hand with fingers slightly opened, and distant about 15 inches, I saw the bones in my fingers, as clear and distinct in outline as with the X-ray. So did others of the party. Again, the feather held in same manner between the eye and the sun when near the setting horizon, showed all the colors of the rainbow in same order and position. Please give the philosophy of all this. A. The experiment you made in looking through the meshes in the feather was an experiment in diffraction. When you looked at your finger held at a distance from the feather you saw a fringe or shadow which followed the outline of the edges of the finger. It did not resemble the outline of the bones at all, as they are seen on the fluorescent screen by X-rays. By the X-ray you see the bones as shadows, larger at the joints; you see the tapering shafts of the bones also. Here you only see the outline of the flesh of the fingers in a double line on each side of the finger. To test the matter use a lead pencil or a stick of about the size of the finger, and you can see the bone in a stick exactly as well as in your finger. There has been a very ingenious toy called the "bonescope" made on this basis. A piece of fine cloth is stretched over a half-inch hole in a bit of wood, which may be two inches across and a half inch thick. On looking through the hole in the center you may see all that you describe. The colors seen on the horizon and in looking at the setting sun are due to the interference of light. You will find all these appearances described, under "Diffraction and Interference of Light." The experiment is very curious, but is explained without difficulty. See Weight's "Light," which we can furnish for \$2 mailed.

(9379) G. E. C. asks: 1. How many cubic feet capacity would be necessary in a tank or other reservoir, holding compressed air at a pressure of 200 pounds to the square inch, at the start, to run an engine furnishing 1 horse-power one hour? How large if the pressure was only 100 pounds at start? A. An engine running at a uniform air pressure of 50 pounds per square inch, at one half cut-off, requires 13 1/2 cubic feet of free air per minute, delivered at ordinary temperature. The supply of air from a high-pressure tank, say of 200 pounds to 50 pounds, reduces the temperature over 300 deg. F. with an expansion of about two and one-half volumes; so that if heat can be added to the air after expansion from the tank, a considerable economy may be obtained in using compressed air from both pressures. The tank must have a reserve ca-