Correspondence.

Feathers and Lightning.

To the Editor of the Scientific American:

It has been commonly believed that feathers were non-conductors of lightning, and timid people have often been laughed at for seeking refuge on a feather bed when lightning was shooting promiscuously about.

The members of our household have lost faith in the feather protection since one day in March of the present year, when our handsome Brahma rooster was killed by a stroke of lightning, the effects of which were felt some distance away. His post-mortem examination showed a badly blackened body, and the shock had passed the entire length of his spine. This is the first instance I have ever known where a chicken was struck by lightning in an open lot.

JOHN J. M. DAWSON.

Viroqua, Wis., May 15, 1893.

The Largest Flour Mill in the World.

To the Editor of the Scientific American:

When a journal enjoying the high reputation for candor and accuracy of statement which deservedly belongs to the SCIENTIFIC AMERICAN "slips an eccentric," it attracts the attention of its friends. In an article headed "Remarkable Dust Explosion," found in the issue of May 20, 1893, are the following remarkable sentences: "The great mill, said to have been the largest flour mill in the world, was blown to pieces," etc., and in closing, "The loss of the mills, which had a capacity of 2,000 barrels of flour per day," etc. Minneapolis is something of a milling town, and I am disposed to correct a statement that a 2,000 barrel mill is the largest flour mill in the world, or that any other city enjoys the distinction of having that mill.

Among the mills of Minneapolis, as well as of the world, the "Pillsbury A" stands at the head. Its capacity is 7,200 barrels of flour per day, which quantity has been actually made in the time. The "Washburn A" has a capacity of 5,200 barrels per day. The "Pillsbury B" follows with 4,000 and the "Washburn C" with 3,200. There are eight or ten mills in Minneapolis making more than 2,000 barrels of flour per day.

The "Pillsbury A" has five railroad tracks running to it. It handles all its cars by machinery, the daily demand being 200 to bring the wheat to and carry the products from the mill. One can hardly comprehend 36,000 bushels of wheat being ground into flour under one roof in one day, and the product being all removed. But this is the daily business, and it moves with the utmost accuracy and apparent ease. That this mill is a "wonder of the world" is shown by the fact that a register is kept as in a hotel, and the daily registration is from one to two pages of names of visitors from all parts of the world. Ushers are constantly employed in conducting parties through the mill, this feature being a characteristic of the courteous natures of the whole Pillsbury family. Minneapolis is the largest primary wheat market of the world, and the greater part of all the wheat coming to the city is made into flour in her mills. The Pillsburys lead, of course, and "Pillsbury's Best" is a familiar legend with the dealers in flour in all the marts of the civilized world.

E. L. OTIS.

Minneapolis, May 23, 1893.

Stars of the Milky Way.

A *Sun* reporter recently spent an evening in St. Louis with Prof. E. E. Barnard, of Lick Observatory. Prof. Barnard is the discoverer of sixteen comets, and he bears the reputation of being the keenest of all the eagle-eyed searchers of the heavens. He is yet a young man, and he is enthusiastic in the work he is now pursuing—photographing the Milky Way.

Original investigators are usually very careful to make no statements concerning their work which facts do not fully bear out, and Prof. Barnard was no exception to the rule. When asked how many suns there were in the Milky Way, he replied: "The old text books said the Milky Way probably contained 20,000,000 suns, but I can photograph more than that number in a five minutes' dry-plate exposure. We estimate pretty accurately that the Lick telescope shows 200,000,000 stars. Of course, you know that photography catches stars which the telescope does not reveal. The greatest revelations now coming to astronomers come along the line of stellar and nebular photography. Modern methods in astronomical photography are such as to give us a quite clear delineation of the Milky Way, nebulæ, and comets. Some of the negatives I have in this little case show us the growth and changes of comets and nebulæ in a most satisfactory way."

Prof. Barnard then exhibited three photographs of the comet which he discovered in October. The first showed the nucleus quite diffuse and the tail split in two sections. A negative made twenty-four hours later showed the head contracted, the tail shorter, and the sections closer together. Strangely, another photograph forty-eight hours later showed the tail elongated and the head condensed, giving evidence of a growth of many millions of miles in the tail in the two days which elapsed between the photographs.

"How many nebulous groups have you discovered in the Milky Way to date?" he was asked.

I have been at work on my photographs about two years, and I think I have found forty or fifty groups of nebulosity supposed to belong to the infant stages of world-making, according to the nebular hypothesis."

Prof. Barnard did not like to make an approximate statement of the number of stars in the Milky Way. Finally, however, he said:

"I do not believe I have half finished my photographs, and it will require three years to complete them, for it is tedious labor, which often requires many hours' exposure, at favorable times, aided by a delicate manipulation of fine instruments. At the conclusion of my labors I believe an estimate may be made, and I think these little specks will prove to be say 500 millions of suns. You must know that no known clockwork will move the instruments so as to keep a given star in one position, so the fingers must be used to adjust the camera. Furthermore, we have to wait long for just the proper conditions for this work."

Prof. Barnard's plates are the most complete and satisfactory ever undertaken, for, besides being an eminent and competent observer, he has been a photographer from childhood. Making photographs of the Milky Way interests him more than any other work he has ever undertaken, and the work has been fruitful in unlooked-for directions. It was while doing this labor that he noticed certain displacements and lights which led to the discovery of many comets. The photographs of suns so large that ours is a grain of sand on the infinite shores of matter in comparison do not show larger on his plates than the thousandth of an inch in diameter, while movements of mighty orbs at the appalling velocities of hundreds of miles per second are slower in the telescope than the creeping of the hour hand on a small clock's face.

"Yet a vaster thought," said Prof. Barnard, "is that the Milky Way, thickly studded as it is with giant stars, and resplendent with varied lights and magnitudes, shows that every star has back of it a luminous background of possibly millions of suns; and the black spaces on my negatives, which presumably show the vault of empty space, in reality represent billions of miles of the universe, which a longer exposure of the plates would probably people with infinite suns, each with its train of planets, surging with the throb of life and responsive to the control of law."—*New York Sun.*

Life in the Arctic Regions.

Dr. W. H. Neale writes as follows to the London *Times:* As medical officer to Mr. Leigh Smith in his two expeditions in the Eira in 1880 and 1881–82, I can speak with some experience of the advisability of choosing this route for an expedition which intends to spend the winter in the Arctic regions.

As you know, the Eira reached Franz Josef Land easily in 1880, about 150 miles of new coast line were discovered and accurately laid down in the chart, and the whole expedition returned to England the same year. In 1881 Mr. Leigh Smith again reached Franz Josef Land without any difficulty, but, unfortunately, while waiting for the ice to clear away from the land to enable further exploration, the Eira was crushed between the land ice and the pack, and sank about two miles from C. Flora on August 21, 1881.

Between the time the ship was crushed and her going down, we had about two hours to save provisions and clothing; during that time we were able to save enough bedding for all hands, and enough provisions to last us about two or three months.

It was not a very hopeful look-out for us. Twenty-five men to be left on an unknown land, with, at the outside, provisions enough for three months, with only four open boats, and a certainty that 12 months must elapse before we could be relieved, or take to our boats and effect our own escape. However, everything turned out well; within two weeks of losing our ship we had built a hut with stones and turf, and covered it with sails; in this 25 of us lived for ten months, without any case of illness appearing among us, after which we spent six weeks in our boats getting to Nova Zembla, where we met the Hope, which had been sent out to look for us under the command of Sir Allen Young. When I state that we had no lime juice, very few tinned vegetables, and very little flour, most people will be surprised that we all returned home, and never had a case of scurvy or sickness break out after the loss of the ship.

This clean bill of health was, in my opinion, entirely due to our being compelled to live on the food we were able to obtain by shooting the animals of the country. During the year we consumed 36 polar bears, 29 walrus, and over 2,000 loons. Every animal we shot was carefully bled before it was cut up, and every drop of blood we could save was kept in tins or pails. This blood was frozen within 15 minutes of its being obtained, and it was kept frozen until we wanted it for use; every day, if possible, about 1 lb. of blood was put into the soup, and by this means we had a daily supply of fresh blood. When I say fresh blood, I maintain that blood, frozen before it has time to coagulate, retains all the properties of blood just drawn from a live animal, and if you can keep men on this food during the winter, you will not know what scurvy is. If, on the other hand, we had saved enough tinned meats to last us through the winter, we should never have managed to make the crew eat fresh meat, and scurvy would have thinned our numbers long before the summer came. Only those who have been in the Arctic regions can know how a crew composed of whalers will do all they can to obtain tinned meats, and refuse bear or walrus as long as they have anything else to eat.

One good point, then, in favor of the Franz Josef Land route is the fact that there is an abundance of fresh meat to be obtained during the winter months, if you only have a rifle and a few cartridges. Another point in favor of this route is the mildness of the climate. Compared with that of Smith's Sound, where Sir George Nares wintered with the last English expedition, the climate of Franz Josef Land is decidedly mild, and the difference of the temperature charts of the two expeditions was much more than could be accounted for by Sir George Nares being two degrees further north than we were.

Fire Jets.

In a paper recently read before the American Water Works Association, Mr. J. T. Fanning dealt with the question of supply for fire service. First, as regarded the pressure necessary; as a general rule he thought that a pressure capable of throwing a jet 80 feet high was sufficient to meet the requirements of small cities and the suburbs of large ones. The lofty office buildings common in large American cities required, however, special methods. To facilitate the preparation of plans, Mr. Fanning has prepared the following table:

Vertical height of stream.	Diameter of nozzle.	Pressure at the play pipes.	Horizontal projection of streams.	Imperial gallons discharged per minute.	Pressure lost per 100 ft. of 2½ in. hose.
ft.	in.	lb. per sq. in.	ft.		lb. per sq. in.
70	1	46·5	59·5	162	10·75
70	1 1/16	44 5	61·3	199	15·50
70	1 1/4	43	66	245	22·75
70	1 3/8	41·5	67	292	32·50
80	1	59	67	184	13·50
80	1 1/8	55·5	69·5	215	19 40
80	1 1/4	53·5	72.4	274	28·40
80	1 3/8	51·5	74·4	328	40
90	1	78	76·6	214	17 70
90	1 1/4	72	78·5	259	25·40
90	1 1/2	68·5	81	310	35 90
90	1 3/8	65·5	82 6	374	51·40
100	1	125	88	249	23·50
100	1 1/8	103	89	301	33 80
100	1 1/4	93	92	368	57·75
100	1 3/8	88	92	432	72

Jupiter and His Satellites.

Dr. Wm. H. Pickering, Director of the Boyden Astronomical Station of Harvard University, at Arequipa, Peru, has made new and interesting observations relating to Jupiter and his satellites, which are set forth in the May number of *Astronomy and Astro-Physics.* He says:

The first conclusion to be drawn from these observations is that Jupiter is not self-luminous, but is only visible when it is illuminated by sunlight. The second conclusion is that it is surrounded by a rare atmosphere outside of its cloud surface, which is capable of producing a measurable refraction. This refraction has been computed, employing the observations at first and third contact, and these when the satellite was separated from the terminator by 0·5″ and also by its own diameter. Employing the third of these observations as our standard of comparison, the refraction of Jupiter's atmosphere at its cloud surface amounts to 0·59″. Employing the fourth observation as our standard, the refraction appears to be 0·38″. The third observation was probably the more accurate, but was partially vitiated since the satellite was not yet free of the planet's atmosphere, which is still sufficiently dense to produce an appreciable effect at an altitude of 0·8″ or 1,900 miles above the planet's limb. If we take the atmospheric refraction at the cloud surface at 0·50″ ± 0·05″, we shall probably be not far from the truth. That the atmosphere should rise to such a great height above the planet's surface was perhaps to be expected from the gradual character of the absorption of the planet's light near the limb. That such a height should be reached in spite of the high gravitation constant in those regions is an independent indication of a high temperature at the planet's surface, and a comparatively low temperature at an altitude of 1,900 miles above it. The faint glow seen beyond the dark limb of the planet for about a minute before the satellite made its appearance was doubtless analogous to the same phenomenon seen preceding the rising of our own moon, and may have been caused also in part by the illumination of clouds in the planet's atmosphere too small to be separately visible.

Earthen Ware Ignition Tubes.

Ignition tubes for gas engines are now made of a composition consisting of kaolin, chalk, sand, and feldspar. These materials are ground up with water before being mixed, and the coarser particles are allowed to subside, the creamy fluids containing the finer particles in suspension are then mixed and allowed to settle. The paste deposited at the bottom is drained, kneaded, and stored for some months in a damp place. It is then moulded into the required shape, and dried by exposure to the air. The tubes are then packed in cylindrical cases of clay, and heated for fourteen days by the flame of a wood fire. Such tubes have lasted 546 days and showed no signs of wear, whereas a wrought iron tube is often destroyed in three days.

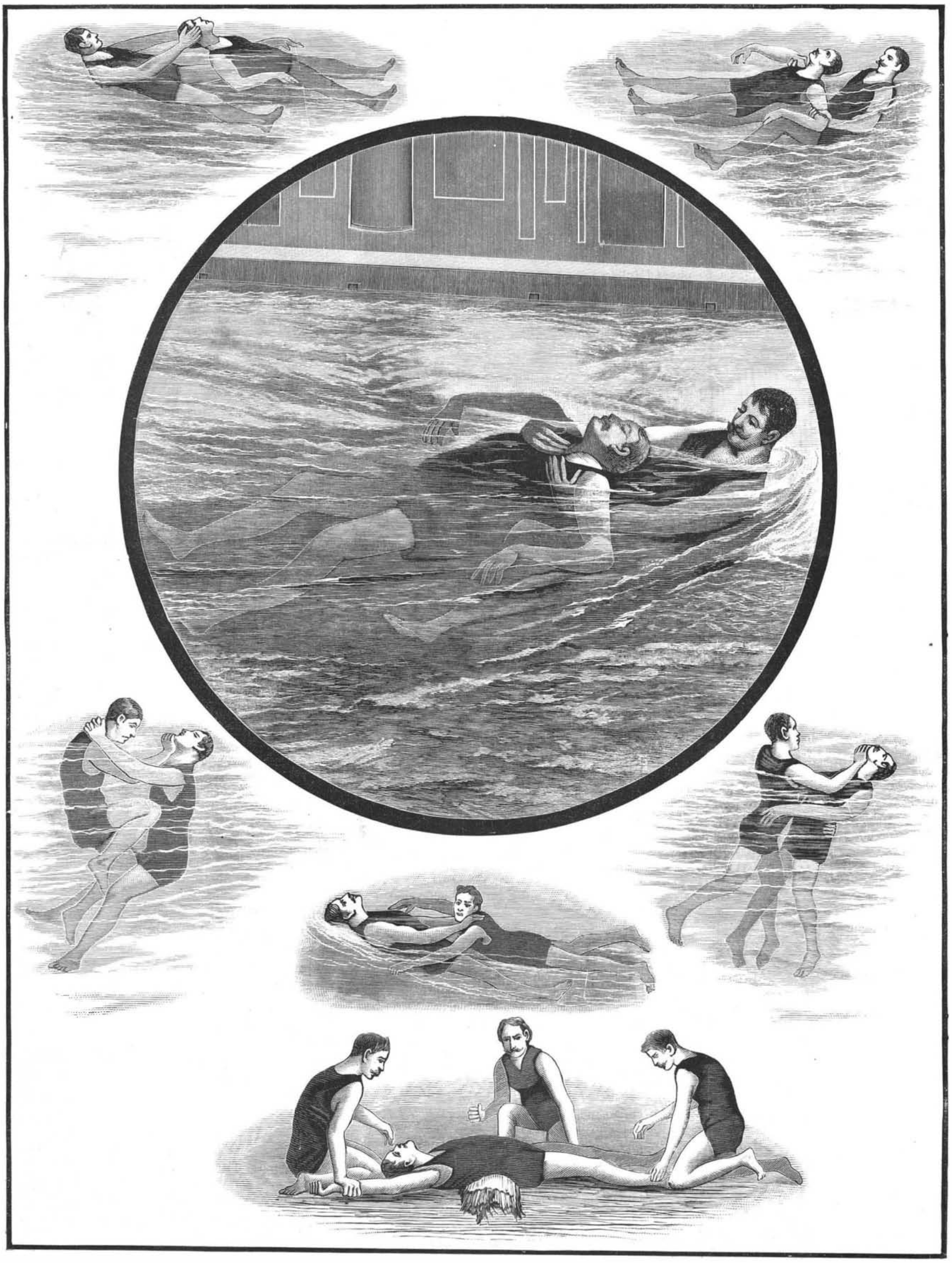
Photography of the Phonograph.

At the recent international congress of physiology at Liege, Prof. Hermann demonstrated his method of photographing the sound of vowels. The vowels were sung out before one of Edison's phonographs. Immediately afterward they were reproduced very slowly, and the vibrations recorded by a microphone. The latter was furnished with a mirror, which reflected the light of an electric lamp upon a registering cylinder, covered with sensitized paper and protected by another cylinder, with a small opening which gave passage to the rays of light from the reflector. By this means were obtained very distinct photographic traces, and the constancy was remarkable for the different letters.

Rescue Practice, First Method—The catch for one who may be quiet when rescued.

Rescue Practice, Third Method—A sure grip when the drowning subject is struggling violently.

Rescue Practice, Second Method—A firm grip when the person being rescued is struggling.



Release Drill—To release one's self when clutched round the neck.

Rescue Practice, Fourth Method—Used in carrying a disabled or tired swimmer. Resuscitation Drill—"Sylvester" method of producing artificial respiration.

Release Drill—To release one's self when clutched round the body.

METHODS OF RESCUE FROM DROWNING AS PRACTICED AND TAUGHT BY THE LIFE SAVING SOCIETY.—*From Black and White.*