first boiled to remove the meat from the fat; then dried and sorted as to size and shape, and sold to the manufacturers of buttons, combs, and similar articles. The hoofs and horns are washed, dried, and sold to comb factories.

The hair of the animal is treated according to its length. Short hair, obtained in the summer, is placed in the digester, dried, and ground into nitrogenous fertilizer material. The long winter hair is cooked in a vat with an alkali, to dissolve the roots and gelatinous matter, and is then washed, dried, and baled for shipment to the hair spinner. It is chiefly used in the manufacture of mattresses. The sinews and hide trimmings are manufactured into glue. The material is placed in a solution of lime, where the fatty matter is saponified, and then washed to free it of lime and render it clean. It is next treated with a weak solution of sulphurous acid to neutralize it; after which it is cooked at a low temperature in large wooden tubs and formed into a glue solution, which is finally reduced in a multiple-effect vacuum machine to the sheet glue of commerce.

It would be difficult to find another of the industries of America in which the application of modern science has wrought better results than in the great meat industry. The adoption of strictly scientific methods has not only improved the quality of the meats, but it has made it possible to transmute the enormous wastes of an earlier day into a wide variety of profitable and useful articles of industry and commerce, and thereby reduce the cost of the entire output.

Silk-Faced Cotton.

The success of artificial silk has caused silk-faced cotton to be somewhat neglected, but "brilliant-ed" cotton closely resembles fine natural or artificial silk. The following are some of the processes:

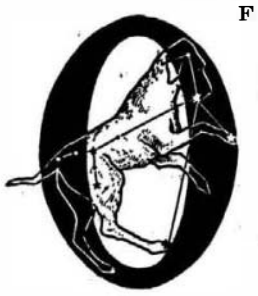
Thomas and Prevost (1907). A hard silky coating is produced by treating the cotton with strong chlorinated bleaching agents and then mercerizing in the usual way, with caustic alkalies. Cross and Bevan recommend the formation of a coating of viscose by mercerizing with caustic soda mixed with carbon disulphide. Cross and Briggs (1907) employ a complex acetic bath, the action of which is confined to the outer layers of the fiber. The bath contains 92 parts of anhydrous acetic acid, 11.5 parts of acetyl chloride, and 6.5 parts of zinc oxide. Prudhomme (1904) mercerizes with caustic soda mixed with ammoniacal solution of copper.

In all of these processes the silky coating is made from the cotton itself. In others, the cotton threads are dipped in collodion, gelatine, solution of natural silk in zinc chloride, solutions of cellulose or artificial silk, etc. Many patents for the production of artificial silk mention the possible employment of the solutions in giving gloss to cotton threads and fabrics. A coating of viscose increases the strength, in addition to improving the appearance of cotton, but produces uneven results and necessitates subsequent bleaching.

It is found that in an ordinary room, from which sunlight is excluded, the brightness of the daylight commonly runs as low as 1/10, or even 1/100 candle-power per square inch. The intrinsic brightness of nearly all artificial lights is much greater than this, which accounts for the injurious effects they produce on the eyes if situated within the range of vision. In a paper read before the Illuminating Engineering Society of Philadelphia, J. E. Woodwell discussed this subject, arriving at the conclusion that the best illumination is a diffused light of from 2/10 to 1/10 candle-power per inch. Although ultra-violet light has heretofore been held accountable for strain and other injury of the eye, he points out that there is less ultra-violet light in the rays of various incandescent illuminants than in direct or even reflected sunlight.

THE HEAVENS IN FEBRUARY.

BY HENRY NORRIS RUSSELL, PH.D.



Of all the aspects that the heavens present to us, none is more impressive than a clear winter night. It is not only that the air is at its clearest, and that the leafless trees hide but little of the sky; the stars themselves at which we are looking are brighter than those which we see in summer.

Let us go out into the frosty air, turn our back upon the Pole Star, and glance at the southern sky. The first thing that we see may well be Orion, whose outline we traced among the stars last month; but as we let our eyes fall toward the horizon, we are arrested by a star of surpassing brightness, so much the superior of all the others that no one could fail to pick it out at once. This is Sirius, the principal star in the constellation Canis Major, and the brightest in all the heavens.

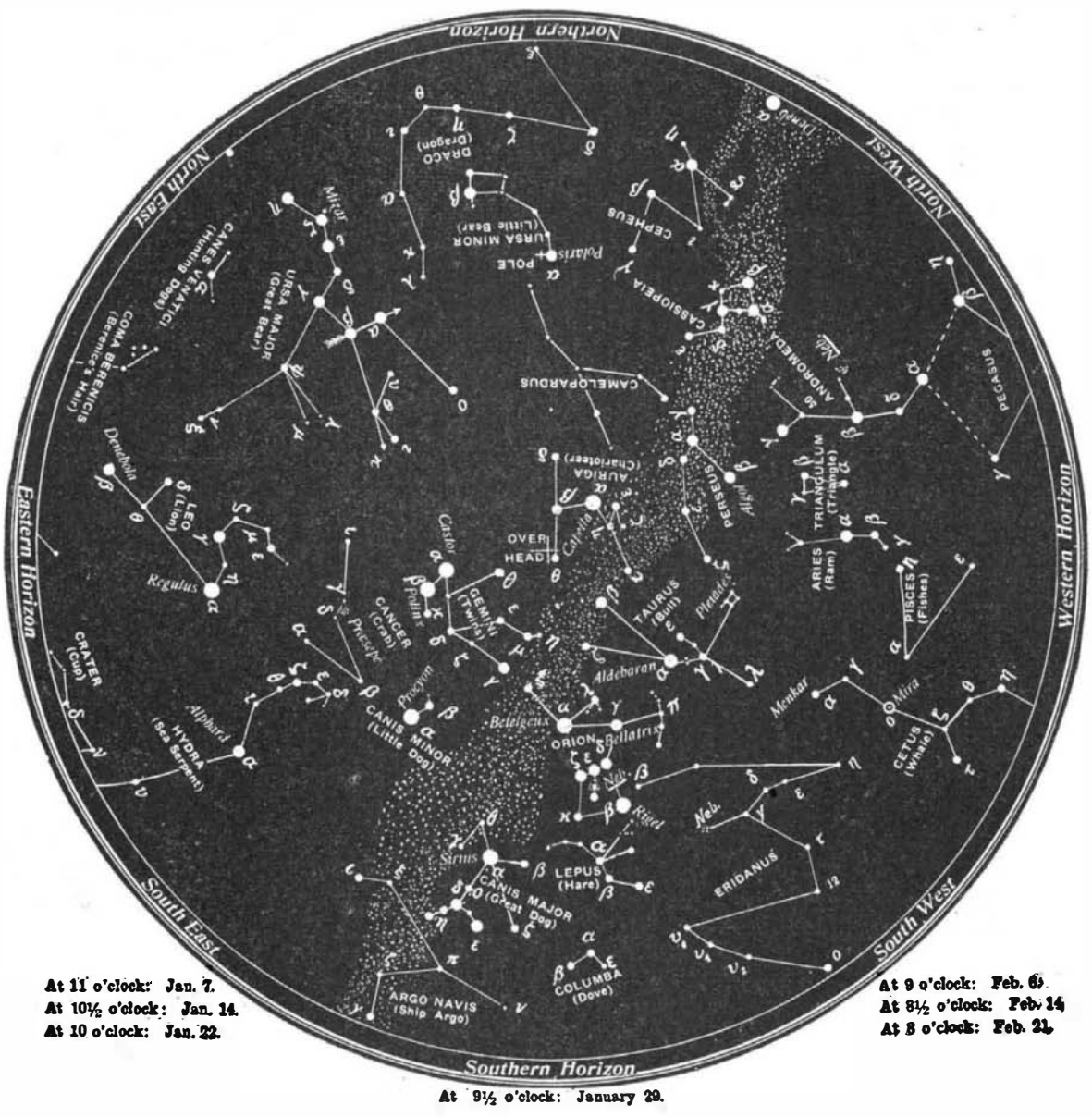
Our map, and the outline figure above, show us how the other stars of this constellation are situated. The conspicuous group resembling an irregular cross about fifteen degrees southeast of Sirius is the Great Dog's hind quarters; and two isolated ones farther to the right, mark his fore and hind paws. It takes a good deal of imagination, when only the stars are before one, to see any resemblance to a dog; but the constellation, however it might be named, is a natural group, and stands well separated from all others.

Sirius deserves further mention. It is notable not only for its brightness, but for its large proper motion, which carries it in a southwesterly direction—almost in the opposite direction to that in which Procyon lies—at the rate of about one degree in 3,000 years. This seems slow, but when magnified by the telescope, the motion in even a single year can be detected with certainty by suitable measurements, and it is much greater than that of most stars. All this makes it seem likely that Sirius is really near us—as the stars go—and the determinations of its parallax show that this is really the case. In fact, so far as the latest researches show, it is nearer to us than any other star that is visible in our latitude, its distance being about 8½ light years. That is, its light takes 8½ years to reach us, and we see it now as it was—and *where* it was—in the middle of the year 1900.

Sirius has of course been very frequently observed, and it was discovered long ago that unlike most stars, it was not moving in a straight line. If its positions, as found by observation for successive years, were mapped, they will lie on a wavy curve, deviating, now to the right and again to the left, from the direct line. The "waves" occurred regularly, at intervals of about fifty years.

Now, according to the basal principles of mechanics, no moving body deviates from a straight line unless some force acts on it. In the case of Sirius, there was evidently a periodic force at work, pulling it alternately to the right and left—and also setting it forward or behind—and repeating itself after fifty years. The only available explanation was that Sirius was attended by a companion star, too faint for us to see, but sufficiently massive to affect its motion by its attraction, which pulled it now one way, now the other, as the companion star moved round Sirius in its orbit—the period of revolution being of course fifty years.

This explanation was given by the German astronomer Bessel about 1850. Fully twelve years later—in 1862—Alvan Clark, the maker of all the greatest American telescopes, having completed a new instrument of great power, turned it on Sirius. At once a faint companion star appeared—too faint to be seen with the smaller telescopes previously in existence—and this was just in the direction in which Bessel had predicted. Since then it has almost completed a revolution about its primary, moving exactly as was predicted, before it had ever been seen.



At 11 o'clock: Jan. 7.
At 10½ o'clock: Jan. 14.
At 10 o'clock: Jan. 22.

At 9 o'clock: Feb. 6.
At 8½ o'clock: Feb. 14.
At 8 o'clock: Feb. 21.

At 9½ o'clock: January 29.

NIGHT SKY: JANUARY AND FEBRUARY

Above Orion, on the opposite side from Sirius, is Taurus, with the clusters of the Pleiades and Hyades, of which we spoke last month. Right overhead is Auriga. Gemini is close on the southeast, and Canis Minor, with the bright star Procyon, lies below.

In the southeast is part of Hydra, and due east is Leo, in the lower part of which is the brilliant planet Jupiter. Ursa Major is high in the northeast. Draco and Ursa Minor are due north, below the pole, and Cassiopeia and Cepheus are in the northwest, with Alpha Cygni (Deneb) on the horizon below them. Pegasus is setting, north of west. Above him is Andromeda, and higher still, almost overhead, is Perseus. The remarkable variable star Algol, in this constellation (which is eclipsed by a dark companion at regular intervals of 2d. 20h. 49m.), will be faint (i. e., eclipsed) about midnight on the 6th, 9 P. M. on the 9th, 6 P. M. on the 12th.

Due west we find Aries and Pisces. Saturn, which is in the latter, is just setting. Cetus and Eridanus fill up the large dull space in the southwestern sky.

THE PLANETS.

Mercury is evening star until the 11th, when he passes through inferior conjunction and becomes a morning star. At the beginning of the month, when he sets at about 6:40 P. M., he may be seen shortly after sunset.

Venus is morning star, but is steadily getting nearer the sun, and becoming harder to see. All through the month she rises at about 6 A. M., but as sunrise comes earlier and earlier, she will be harder to see. On the 19th she is in conjunction with Mercury, who is then four degrees south of her. Mars is morning star in Scorpio and Sagittarius, rising about 3:20 A. M. on the 15th.

Jupiter is in opposition on the 28th, when he rises at sunset, and is visible all night long, and a fine object in the smallest telescope. Saturn is evening star in Pisces, setting about 9 P. M. in the middle of the month. Uranus is morning star in Sagittarius, observable before sunrise. Neptune is in Gemini, invisible without a telescope. On the 16th he is in R. A. 7h. 3m. 25s. and declination 21 deg. 53 min. north, and is moving 5s. westward and 9 min. northward per day.

THE MOON.

Full moon occurs at 3 A. M. on the 5th, last quarter at 8 A. M. on the 13th, new moon at 6 A. M. on the 20th, and first quarter at 10 P. M. on the 26th. The moon is nearest us on the 20th, and farthest away on

the 8th. She is in conjunction with Neptune on the 2d, Jupiter on the morning of the 7th, Mars on the 15th, Uranus on the 17th, Venus and Mercury on the 18th, and Saturn on the 22d.

Princeton University Observatory.

SOME BREADS OF OTHER LANDS.

BY L. LODIAN.

One of the brothers Reclus, professor of geography at the Brussels University, has left a posthumous work (as yet unpublished) entitled "L'Histoire du Pain." When this History of Bread is issued in due course, it may be taken for certain that it will be—considering its source—a most important contribution to sociologic literature. For the subject has never been "done" before. A like remark applies to the present paper on some of the curious breads of other nations. The writer, before beginning work on it, looked up every source of reference.

THE KASAVA BREAD OF LATIN-AMERICA.

This is the naturally whitest of all breads—without any of the so-styled "electrical" bleaching of modern roller-mill processing. The name is derived from the Caribbean-Indian word of the plant *kasabi*, and is variously spelled *kasava*, *casava*, and half a dozen other ways. However, as the tendency of the times is toward the restoration of indigenous spelling, *kasava* is perhaps the best rendering of *kasabi*.

When the Genoese Colon first reached the Isles of the Antilles, he found the aboriginals using for bread the pulped root of this kasabi plant. Later, the *tortilla* (maize bread) was found in use on the mainland.

Kasava bread is a most important article of diet to this day among the natives of tropical America, especially in interior Brazil and Paraguay.

For convenience in baking, it is always made in thin wafer-like cakes, as noted by the earliest travelers. Taken with coffee, it is a quite "satisfying" diet—far more than it looks—due to its rapid absorption of moisture and swelling to produce that feeling of distension which is called "filling."

Blackest of all breads is the *palt brod* of Lapland, northern Scandinavia, Russia, and the far north of Siberia. It is a kind of rye bread, and is regarded as highly nourishing—as it must be when reindeer sledge parties subsist on it and unsweetened brick tea for weeks together, with an occasional diet of fish. It has a slight albuminous taste; and is sometimes soaked in hot reindeer fat to augment, not its nutritiveness, but its heat-imparting capacity.

The Norsemen also have a peculiar hardtack bread of unmilled rye. The rye grains are soaked, mashed by pounding, then lightly baked in circular plate-like disks about twelve inches diameter, and one-tenth to one-seventh of an inch thick. In its center is a hole, and it is stored by racking away on thin poles after baking; or suspending by batches on strings below decks on fishing smacks (for it is the chief bread of the fisher folk). It is eaten with and by dipping in the soups, or by stirring in the coffee, or even alone, like biscuit.

The Italians have a nearly similar disk-like hole-centered bread for their coast-working population. It is known as macaroni *pane duro* (macaroni hard-tack), and is eaten by momentary soaking in their cheap light wines; it may be used in the soup, but is always inferior to the real strip or perforated macaroni. Like this last, it is of a light yellow color, brittle, and has nearly the same glutinous taste.

So diverse is the population of New York, that most breads of different nationalities can be obtained in their respective bakeries. Thus, the characteristic three-cornered oat bread, in cake-like form, can be obtained at several Scotch bakeshops. It lacks, though, the home-made simplicity and purity of the native bannock—being "Americanized" to suit the Scottish-American acquired taste.

It is little known that of all the foreign languages prevailing in New York, the Russian language has the greatest number of speakers. There are about three-quarters of a million familiar with it. True, the vast majority of these are provincial, and mainly converse in their own jargon, but they are as familiar with Russian as the Irishman is with British.

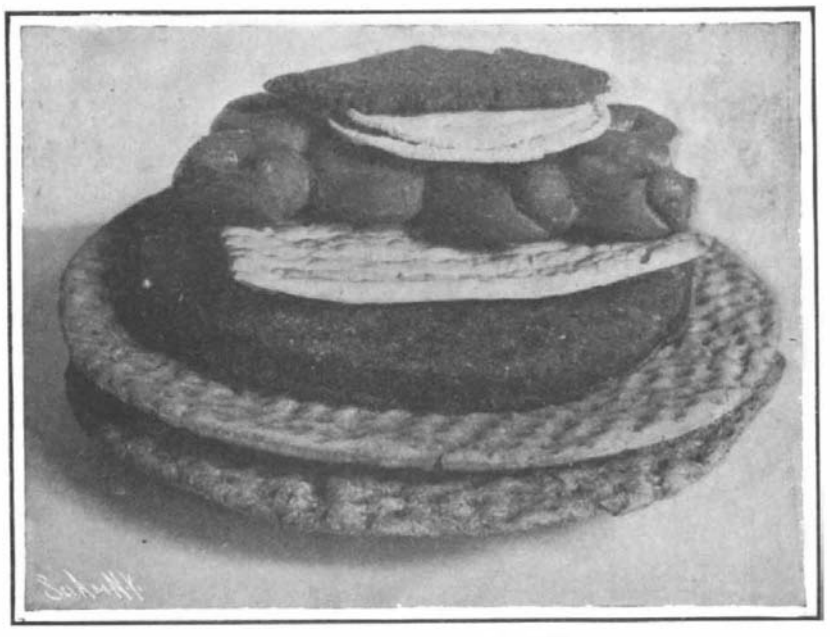
Bread for the hordes of Jew folks, mostly of Russian origin, is quite an industry in the Hebrew quarter of Gotham. There are bakeries for the production exclusively of the matzoths, or unleavened bread. This is both square and round shaped, very friable, and to the Gentile about as uninteresting and insipid a bread as could be conceived. At the same time, it is one of the simplest and purest of breads.

The Italian breads present the greatest variety and solidity and purity of any. Some of their family loaves are big as cartwheels, and retain their table acceptability, without becoming too dry or hard, for a week to ten days. They have also about a dozen varieties of hardtack breads, for dipping in and taking with wine or coffee, or for soup use. But these dried breads, while satisfactory to the Italian, would be pronounced a poor standby by an American. Like meat which has been baked to a crisp, they seem to have had most of the virtue baked out of them by excessive heat. The Italian chestnut bread (*kastagnacio*) and bean bread are also obtainable in Manhattan.

A LOAF OF ITALIAN BREAD.

Of all the hardtack breads of the universe, I have found (by actual experience during many years of almost every known variety) the small ringed bread of Siberia the most substantial. When the Russian engineering parties were constructing the trans-Siberian railroad, this white ring bread (with the coarse rye bread) was their main "staff of life."

It is made without salt or yeast, and is first steamed, then lightly baked to expel the moisture. Some curious uses were made of these breads by the engineers. When soaked in hot pure tallow for a few moments till they sank, they were used in soups or soaked in and eaten with tea, during the severe winter months. This tallow bread was considered the most heat-producing article in the dietary. It is a product which should be utilized by our Arctic explorers. Another curious use to which it is put is as an extempore candle, or coffee-pot boiler. A nail is used to make about eight holes in the tallow ring bread; wax vestas are placed in these and ignited. It will burn slowly for about an hour, emitting a strong heat sufficient to warm and light a small tent, and boil the tea or coffee water. There is a rather strong odor of toasting bread, but that is tolerated in preference to smoke. While sojourning with the engineers in Siberia, I have also seen them using the larger sizes of ringed bread as makeshift quoits for Sunday afternoon sport in their tents, and the bread would stand the knocking about pretty well, and would eventually appear in the soup at the evening meal.



SOME CURIOUS FORMS OF BREAD.

Small Siberian storekeepers also use the ringed bread as an abacus, or primitive counting apparatus for calculating small sums in rubles and kopeks, and simple figuring. Three strings are suspended above the counter; ten breads are strung on each; the top line represents the rubles (their money transactions rarely going above ten) and the two lower strings stand for the kopeks. Of course, the strings of bread can be increased to mount into the thousands and up, if desired. Even this singular multi-usable bread can be obtained in Manhattan at various bakeries of erstwhile Russian citizens, but its use is here confined to the table.

Bread has various applications besides table use. We are all familiar with its therapeutic uses as poultices *et al.*; for erasing stains and marks; for (toasted to a crisp) the infusion known as toast water, and a dozen other uses.

Perhaps its most singular application is—in the form of dough—its use for cleaning parts of timepieces in one of the Waltham watch factories. A recently printed statement gave out that one of these New England horological factories used up some eighty pounds of bread dough per diem for this purpose. The refuse was not wasted, but used on a chicken farm in the region.

The "Bishop Ring" is Seen Again for the First Time Since Its Discovery.

For several months after the eruption of Krakatoa in 1883, there was a haziness in the atmosphere, and remarkably gorgeous sunsets were observed in various parts of the world. The great eruption of Mont Pelée in Martinique was followed by similar phenomena. The generally accepted theory among scientific men as to the cause of these phenomena was propounded by Dr. Sereno Bishop of Honolulu, and is known as the Bishop theory. At the same time Dr. Bishop observed a ring round the sun, to which the name of the "Bishop ring" was given. On the first of January Dr. Bishop, for the first time since the eruption of Krakatoa, observed the sun ring, and attributes its appearance to the recent disturbances in Sicily and southern Italy. The Bishop theory is that a volcano in very active eruption throws out immense volumes of impalpable dust into the higher strata of atmosphere, and that this dust spreads through the rarefied air until it surrounds the globe.

Dr. Bishop is the oldest living white person born in the Hawaiian Islands, and has devoted much study to volcanoes and their phenomena. He is now eighty-two years of age.

The residents of Geneva in Switzerland say that for two days about three weeks before the earthquake at Messina in Sicily, the waters of Lake Geneva rose and fell in a strange manner, as though sucked in by a siphon and then permitted to flow out again. It is said that the same phenomenon was observed before the earthquake on April 18, 1906, in San Francisco.

The Current Supplement.

Never has an earthquake exacted so terrible a toll of human life as that which has just devastated Calabria. A scientific examination of this calamity is presented in the current SUPPLEMENT, No. 1726. Some twenty pictures are used to illustrate the article. Gas producers for use on shipboard have been pretty well discussed, but all the arguments have presupposed that the present type of slow-speed high initial pressure explosive engine would be used. E. W. Percy in an essay entitled "A Large Gas Engine for Ships" inquires whether a more suitable type of engine cannot be constructed, and argues that the 2-cycle, 3-cylinder fuel injection engine is the coming type. About ten years ago were discovered the first remarkable exceptions to the general rule that crystals are solid and rigid bodies. Prof. Ernst Sommerfeldt reviews the history of that discovery, and gives a brief and succinct account of the present state of our knowledge. Lombroso gives his views on the happiness of lunacy and genius. R. E. L. Maunsell writes on modern workshop practice, in which he discusses high-speed tool steel. Dr. Gradenwitz describes a method for wirelessly transmitting handwriting, drawings, and photographs. Our aeronautical readers will be interested in W. R. Turnbull's account of his new researches on the form and stability of aeroplanes. The Science, Engineering, and Trade Notes and Formulæ are given as usual.

Much success has been attained in repairing automobile crank or gear cases. The sides may be knocked out completely; but to the surprise of many who are not only well posted, but scientific in the art, welding of the damaged parts has been accomplished so as to make the case one solid piece. This new method of repairing gear cases saves the owner of a car not only considerable expense, but much time and delay. In engines of foreign make, for example, it takes from three to four months to get new aluminium cases, and then the cost is very much higher than what it would cost to weld them.