MAKING VALENTINES BY THE MILLION.

Few people realize what a large industry has grown out of the custom of giving valentines on the 14th of February each year. The valentine idea seems to have originated in England, and is now practised by English-speaking people the world over. Germany, although it does not recognize the day, supplies many of the cards and novelties used in the United States. Of late years America has taken the lead in the valentine industry. Now we not only supply our own market, but export large quantities of valentines to all parts of the world. The largest valentine supply house in the world is located in this city, and here a large force is busy the year round working to meet the enormous demands.

The accompanying photographs illustrate the various processes followed in the manufacture of the different kinds of valentines. There are three principal types of valentines, namely, the comic, the old-fashioned lace, and the "novelty" valentines, the latter being the most expensive. The comics, which seem to be by far the most popular, are photo-engraved and printed in color in the usual manner, and therefore need no special comment. Special machines, however, are required in the production of lace valentines, while the novelty valentines are largely made by hand. One of our illustrations shows the machine which makes the paper lace. It consists of two rolls, one a die, and the other a matrix of the desired design. A wide paper ribbon passes between the rolls, and is cut by them. A brush bears against the matrix roll, cleaning off any adhering bits of paper, and another brush which bears against the ribbon removes the cuttings from the lace. The paper is chalked before entering the rolls, to prevent the lace from sticking to them and tearing. This lace paper is fastened with paper hinges to embossed cards. The hinges are made by a small hand-operated machine, which creases long strips of paper by folding them in and out like camera bellows, and from these strips the hinges are cut off as desired. The cards to which the lace patterns are attached are printed in large sheets with a suitable design, after which they are embossed. The embossed sheets are now passed on to the folding table, where they are folded in sets of three, and then fed into the cutting machine. This machine is provided with cutters of various design, which cut out the cards with scalloped edges. The hinged lace frames are now glued onto these cards, thus forming the familiar old-fashioned lace valentines, which still find favor with a large portion of the public, and refuse to be displaced by the more modern designs. Of the latter, one of the simplest consists of a card with various celluloid ornaments attached thereto. The ornaments are cut out by hand with a punch and maul. The ornaments are then attached to the cards by means of a simple riveting machine, which is illustrated in one of the engravings. The small brass rivets are carried in a cup at the top of the machine, and are fed down into a channel by the notched wheel which may be seen near the upper end of the machine. At the bottom of the channel is an escapement which, at each operation of the machine, releases a rivet and lets it drop down under the riveting hammer. Valentines of this sort can thus be very cheaply made.

The more expensive novelty valentines are made up with silk and satin puffs and bows of ribbon, which must be applied by hand to the cards. The only machine work done on these valentines is the printing of the colored design and the blocking out of the cards. The rapidity and neatness with which the puffs and shirred borders of the various designs are made is remarkable. In making a heart, for instance, hot glue is lightly applied to the card along the outline of the heart. The puff is then made from a semicircle of silk, the edges being gathered as they are pressed into the glue by drawing and puckering them with the

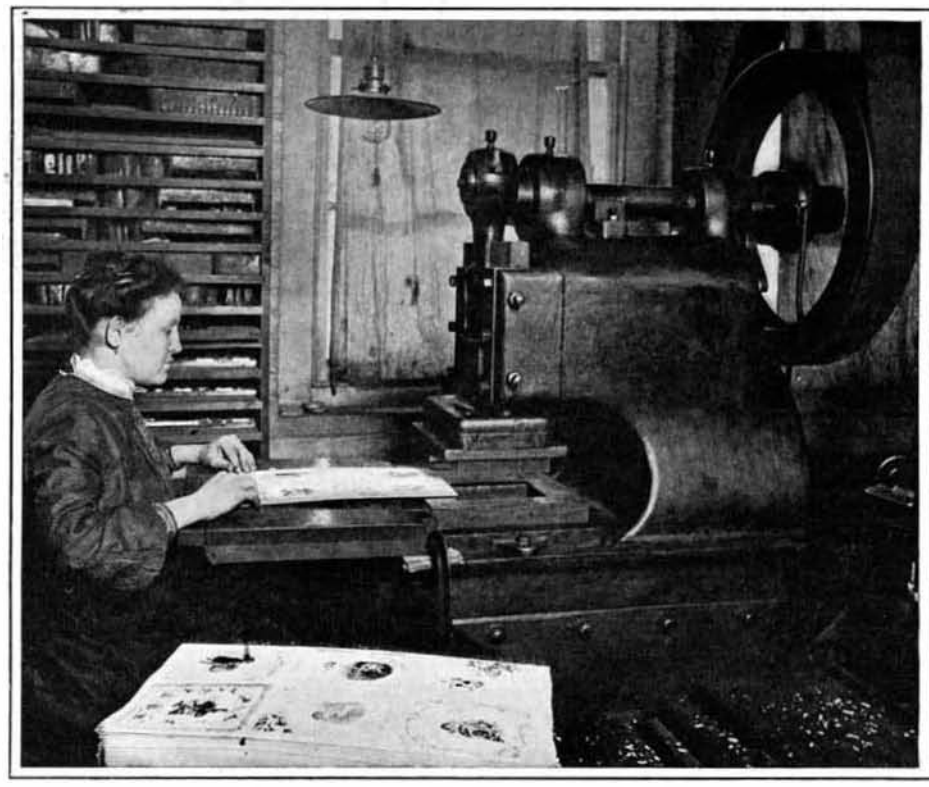
Making up the Silk and Satin Novelty Valentines.

Getting up Designs for Next Year's Trade.

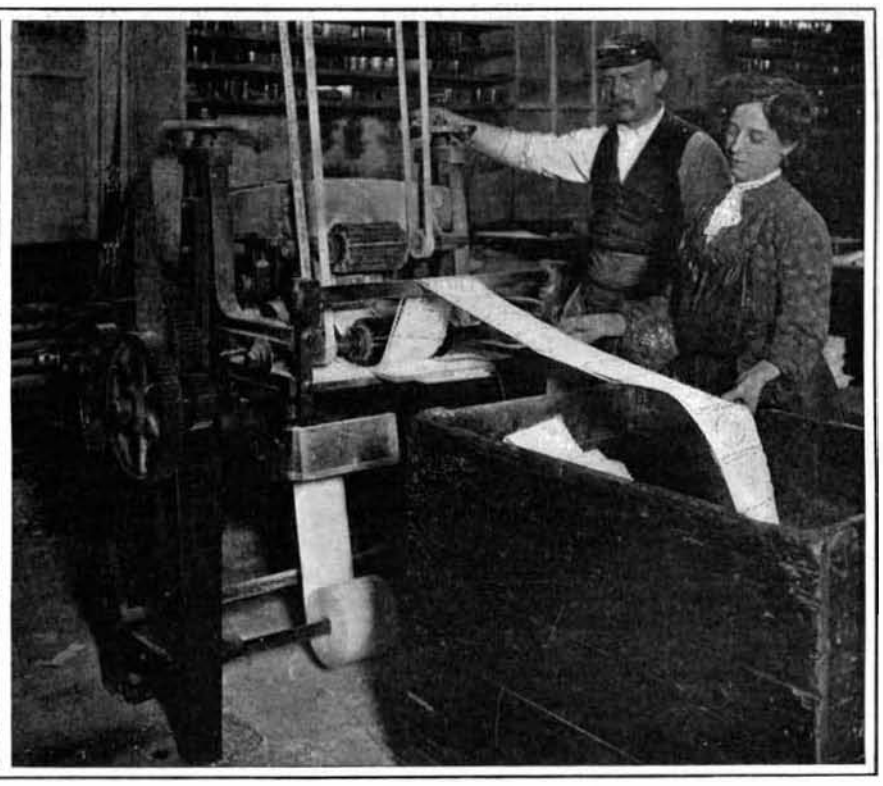
Riveting on the Celluloid Ornaments.

Correcting a Proof Sheet of Comics.

The Embossing Machine.



Cutting Out the Cards with Scalloped Edges.



The Lace-Making Machine.

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fingernail. The borders are made of two pieces of cardboard cut to the proper curve and covered with colored silk, which is lapped over the cardboard and glued to the under side. This silk, also, is gathered as the edges are glued down, and the border pieces are then glued over the edges of the puff. In a similar manner many apparently intricate designs are very simply made.

Some of the valentine designs are carried in stock, from year to year, but each season demands its innovations, and expert designers are constantly at work endeavoring to get up new designs to please the sentiment of the lovelorn, as well as to touch the risibles of the practical joker.

THE TOTAL SOLAR ECLIPSE OF 1905.

An eminent astronomer, a man who has led several eclipse expeditions, once remarked that he had never seen a total eclipse of the sun, because he had always been "too busy observing them." He meant exactly what he said. With a whole battery of telescopes, coelostats, and cameras under his command, for the perfect operation of which he was answerable, he saw no more of the majestic event occurring before his very eyes than a stoker on a transatlantic liner sees of the waters about him. It is not from the little army of men who composed the nine expeditions sent out from this country and the many more who were sent out by European observatories from whom any stirring description of the eclipse of August 30, 1905, is to be expected, but rather from the thousands of unscientific spectators who had nothing to do but gaze at the sun through a piece of smoked glass and wait for the moment of first contact.

The eclipse of 1905 was visible on a comparatively narrow strip of the earth. Its path began at sunrise south of Hudson Bay in Canada, entered the Atlantic Ocean a short distance north of Newfoundland, diagonally crossed Spain, swept over the Mediterranean, traversed Algiers, Tunis and Egypt, and ended at sunset in southeastern Arabia. Along that path a shadow followed the moon as it swam between earth and the sun, exactly as your shadow follows you on a sunny street. When the shadow of the moon reached an astronomer stationed along the line that we have traced from Canada to Arabia, the sun was to him eclipsed. For good astronomical reasons a total eclipse can never last very much more than seven minutes, but last year's totality was not even as long as this, enduring at only one point for three minutes and forty-five seconds, and at others for but two and a half minutes. In an entire century it is not possible to spend more than eight days in solid observation of total solar eclipses. Lack of time is not the only limitation imposed on the eclipse observer. Although the path traced by the moon's shadow is several thousand miles long, he must take up his position in a narrow strip that cannot possibly be more than 167 miles wide, rarely reaches 140, and is usually between 50 and 100. Furthermore, he is confined to dry land, because a swaying ship is too unsteady a platform for astronomical instruments. Moreover, it is safe to say that any astronomer, watching quietly beneath his domestic dome, and having the good fortune to witness a single total eclipse from its convenient shelter, would, speaking generally, sit there for more than three hundred years before another would darken the same landscape. The only one ever observed in New York city occurred in 1806, and London, in 1715, had not been visited by a total eclipse for six hundred years.

Although the sun rises and sets every day in the year and has risen and set for millions of years, we can safely say, without any attempt at epigrammatic pleasantry, that no one has ever seen it. The real sun is hidden forever from us by a series of outer layers or shells. To regard these shells as the sun itself would be very much like saying that our atmosphere is the earth. All that we know about the sun, the nucleus surrounded by these shells, is merely that it must be hotter than the fiercest furnace we ever built, and that it must amount to about nine-tenths of the total solid mass.

Of the outer shells we do know something. We know, for example, that the invisible core of the sun is surrounded by a layer of incandescent clouds known as the photosphere, and consisting, in all probability, of countless granules having a diameter each of about 500 miles and floating in dark medium. The blazing disk that we call the sun is really the photosphere. After the photosphere comes a stratum 1,000 miles thick which was first discovered by Prof. Young and termed by him the "reversing layer," for the reason that it reverses the lines of the solar spectrum. Lying above the reversing layer for a depth of 5,000 miles is the chromosphere, stained blood-red by the crimson glare of hydrogen. Tongues of flame leap from this red mass often to a height of 10,000 miles, and occasionally to a height of 100,000 and more—tongues that may best be likened to the heaving billows and tossed spray of the sea. Just as the dark moon is apparently about to glide into the sun during a total eclipse, the red flames or prominences, as they are called, flare up vividly for several minutes before and after obscuration.

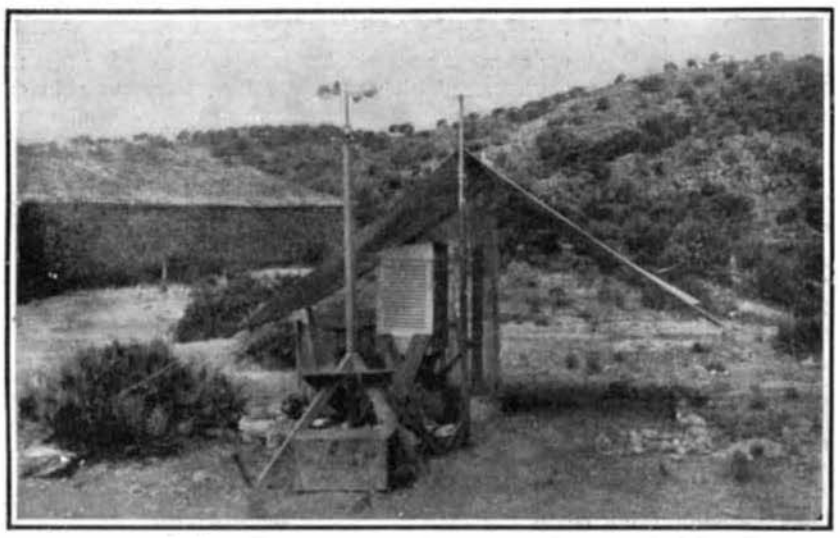
Beyond the photosphere, far beyond the prominences even, extending outward for a distance that may sometimes measure 350,000 miles, lies the diaphanous, pallid corona, visible only during a total eclipse and, therefore, the phenomenon which received most attention during the eclipse which occurred last August.

Words can hardly describe the grandeur of the corona. As the moon steals in between the sun and the earth, and the solar disk is gradually gnawed down to a diminishing crescent, the foliage of trees is flecked with dancing, sunny sickles—minute images of the partially obscured sun. Gradually the solar disk is reduced to a thin silver bow; daylight fast gives place to an uncanny, dull, suffused glow. Faintly fringed with silver light, the moon appears what it actually is—an immense black ball hovering in the sky. From a mountain top the shadow of the moon may be seen sweeping across the landscape with almost terrifying rapidity, blotting out everything before it. The swiftness of motion and the intensity of the blue-black shadow give a feeling that something material is rushing over the earth. The corona flashes out in a weird aureole of pearly light.

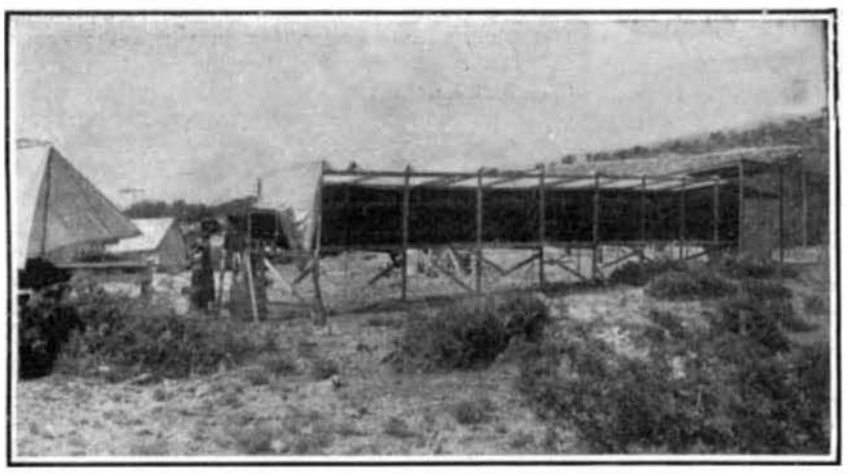
The astronomical draftsmen whose duty it is to sketch the corona, bandage their eyes for fifteen minutes before the total phase, in order that they may be more keenly sensitive to every detail of the corona's ghostly beauty. Numerous photographs are also taken; but the sensitized plate, although it is affected by rays invisible to the eye, is incapable of adequately reproducing the delicate filaments of light that flash out for stupendous distances.

It seems not a very difficult feat to equip a party of men with a few instruments, set them down on a foreign shore for the observation of the corona and other solar phenomena. And yet the leader of such an expedition must have rare executive ability to systematize the work so that each man shall perform his duty swiftly yet surely during the few minutes of totality.

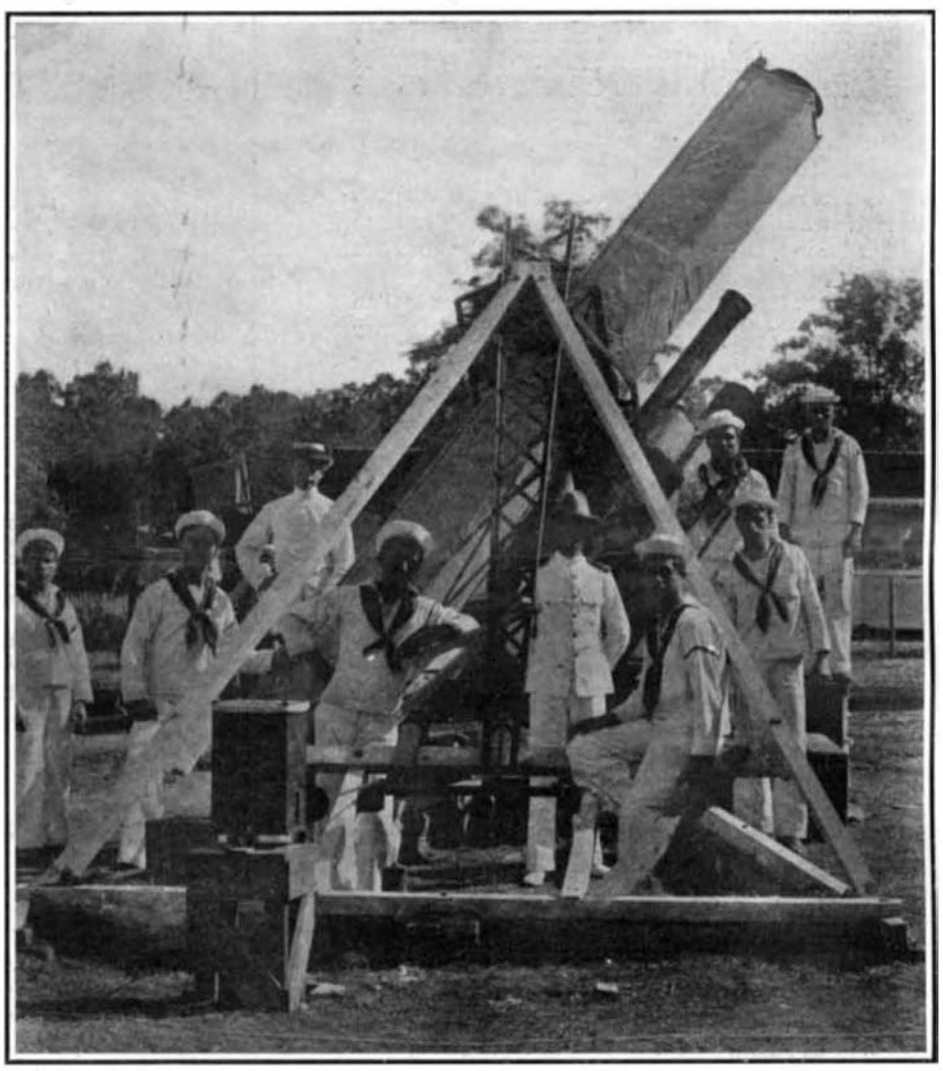
Of the untiring energy lavished by the eclipse observer in operations of observing every phase of the sun's obscuration from the second that the moon touches the edge of the sun to the second when it clears the solar disk, some idea may be formed by recording here briefly the work accomplished by the United States Naval Observatory's expedition sent out by this government under the immediate charge of Rear-Admiral Colby M. Chester, superintendent of the United States Naval Observatory. Months before the darkening of the sun was to occur, the necessary instruments were mounted in the Naval Observatory grounds and tested with the utmost care to make sure of their efficiency. Then they were transported several thousand miles to the site where they were to be used, to three stations widely separated. The first station was located at Daroca, Spain; the second was at Puerta Coeli, 12 miles northwest of Valencia, Spain, and the third at Guelma, North Africa. An enumeration of the apparatus carried at great expense to these distant parts of the earth would read like a page from an instrument-maker's catalogue. At Daroca a 40-foot camera was used, especially designed to photograph the inner corona and its surroundings, besides a polar axis carrying a 14-foot camera, and a 36-inch camera equipped with a Dallmeyer lens and spectroscopes. At Puerta Coeli, Spain, the second station, Rear-Admiral Chester had mounted a polar axis carrying a camera with a



Prof. Bigelow's Meteorological Station at Puerta Coeli, Spain.



The 65-Foot Camera Coelostat and Spectrograph of the Puerta Coeli Station.



Polar Axis at Guelma, Algeria, and the Sailors from the "Minneapolis" Who Helped to Mount It.