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gelatine, or drawn by hand in oil or gum, the bare surface of the material may be cut away to any desired depth. The lines left in relief will be well supported, their base being broader than their top, and there being no under cutting, as is apt to occur in etching on metal with acid. An electrotype from this matrix can be printed from in an ordinary press. The sand blast has been applied to cutting types and ornaments in wood, cleaning metals from sand, scale, &c., and to a variety of other purposes.

Various forms of apparatus may be used to execute the work. In our engravings, Fig. 1 shows a device for roughening sheet glass. The air blast is produced by the fan below, and the air rises through the curved tube, carrying the sand up with it, which is thrown into the air tube by an endless belt of scoops arranged in the lower part of the angular box. The sand is carried up by the air and brought over and down the front air tube, where it discharges with great force upon the surface of the glass, which is contained within the front box and is carried by a belt gradually forward under the sand blast. The sand falls from the glass into the lower part of the angular box, where it is scooped and thrown again into the air current.

Another form of apparatus for boring or engraving is shown in Fig. 2, and the sand is driven in this case by steam, on the principle of the Giffard injector. The sand descends through a tube from the hopper, and in its course the vertical sand pipe is joined by a lateral steam or air pipe, which gives a sudden impulse to the sand and drives it down upon the glass below with tremendous force. The sand tube is flexible, its extremity is carried on rollers, by which it may be moved back and forth to suit the requirements of the work.

Subsequent to the patent of Mr. Tilghman, which bears date October 11, 1870, George F. Morse, of New York, obtained a patent on a more simple contrivance for accomplishing similar results to the Tilghman process, which we also illustrate. The latter patent bears date Nov. 21, 1871.

The inventor provides a single box or hopper, A, from which depends a small tube, C, about 8 ft. long. No machinery whatever is used. A mixture of corundum and emery, in the form of powder, is placed in the hopper, and allowed to descend through the tube, the flow being regulated by the slide, B. The article to be engraved, which may be a silver cup, a watch case, a sheet of glass, a goblet, or other object, is held under the extremity of the tube, so that the engraving powder will fall upon it, and in a few minutes' time the most splendid ornamental designs are cut with marvellous exactitude and surprising beauty. We have seen engraved effects, produced by this process, upon glass and silver ware, that altogether surpass anything that has ever been attempted by the most skilled hand labour.

As fast as the supply of engraving powder runs down through the tube, it is replaced in the hopper; and girls may do all the work. That portion of the articles that is not to be engraved is protected by paper or other substance. The engraving, therefore, is done by cutting out the desired pattern in paper, which is then applied to the surface of the article. The powder only acts between the interstices of the pattern.

(Written for the *Canadian Illustrated News*.)

VAPOURS.

"For what you are is even a vapour, that appeareth but a little time, and then vanisheth away." With a knowledge of the amount of vapour which saturates the air at different temperatures, and the amount existing in the air at the time of observation, we are enabled to determine the degree of the humidity of the air. In calculating the numbers, saturation may be assumed at 100 or as unity, and air, without moisture as zero.

Air is most humid at night; as the sun ascends the temperature increases more rapidly than water evaporates to keep the same degree of humidity; the atmosphere, therefore, becomes less and less humid. This is particularly the case in summer, when the temperature of the dew-point is for some hours nearly stationary, whilst the temperature of the air is increasing.

When evaporation commences in the morning with the increase of temperature, vapour accumulates near the surface of the soil, till the air becomes heated and the daily ascending current of the air sets in. It then ascends and spreads as long as the ascending current continues. Towards evening, when the temperature of the air is decreasing rapidly, the ascending current is checked, then ceases, and gives place to the descending current of night. Therefore there is a rapid increase of evaporation and decrease of humidity during the day, and a rapid increase of humidity during the evening and night hours.

The sun's rays pass through the atmosphere, exercising but little influence on its temperature till they reach the earth, accumulate there, and cause the earth to become much more heated than the air. Its amount is an important element in meteorology, and is determined by the excess of reading of a thermometer, placed near the surface of the earth, fully exposed to the direct rays of the sun, above that of the thermometer, placed to determine the temperature of the air in the shade.

The amount of terrestrial radiation is of equal importance with that of solar radiation. From the surface of the earth heat is constantly escaping, and on cloudless nights the earth throws off heat more rapidly than the surrounding air. Its amount is determined by the defect of the readings of a thermometer, with its bulb fully exposed to the sky, and placed on grass, or on a non-conductor of heat, as wool or flax, below those of the thermometer to determine the temperature of the air in the shade.

A thermometer thus placed, when the sky is covered with low dense clouds will read the same as that placed some feet above it; but on the clouds rising or the sky becoming less cloudy will read from 3° to 5° lower; and when the sky is cloudless and bright, and the air calm, the reading may be from 3° to 20° lower than the air.

The daily amount of terrestrial radiation is dependent on the amount of cloud. During any period when the nights are generally cloudy, there will be but little difference between the readings of the two thermometers.

The formation of dew depends solely on the temperature of the bodies on which it is deposited, and never appears till their temperature decreases below that of the dew-point of the locality.

The amount of water deposited in the shape of dew is the largest on those substances which radiate heat freely, and on which the reading of a thermometer is lowest.

The great difference in temperature of the surface of the earth between day and night affords an explanation of the current of air denominated land and sea breezes. During the day the air in contact with the heated earth becomes heated, expands in bulk, and is specifically lighter, and rises in consequence, when the cooler air from the sea rushes in to supply its place, and thus causes the current called the sea breeze. During the night, on the contrary, the earth is cooled by radiation; the air in contact with it is cooled, becomes smaller in bulk, and specifically heavier than the air over the water, which parts with its heat much more slowly than the land, and a current from the land takes place.

ECONOMY IN THE USE OF COAL FOR DOMESTIC PURPOSES.

The Secretary of the Society of Arts announces that a sum of £500 having been placed at the disposal of the Society, by a gentleman who does not wish his name to be known, for promoting, by means of prizes or otherwise, economy in the use of coal for domestic purposes, the council have decided to offer the following prizes:—

1. For a new and improved system of grate suitable to existing chimneys as generally constructed, which shall, with the least amount of coal, answer best for warming and ventilating a room. The society's gold medal and fifty pounds.
2. For a new and improved system of grate, suitable to existing chimneys as generally constructed, which shall with the least amount of coal best answer for cooking food, combined with warming and ventilating the room. The society's gold medal and fifty pounds.
3. For the best new and improved system of apparatus which shall, by means of gas, most efficiently and economically warm and ventilate a room. The society's gold medal and fifty pounds.
4. For the best new and improved system of apparatus which shall, by means of gas, be best adapted for cooking, combined with warming and ventilating the room. The society's gold medal and fifty pounds.
5. For any new and improved system or arrangements, not included in the foregoing, which shall efficiently and economically meet domestic requirements. The society's gold medal and fifty pounds.

The council reserve to themselves the right of withholding all or any of the above prizes, as the judges appointed by them may determine. The competing articles must be delivered not later than the 1st of December, 1873, with a view to their being tested, and subsequently shown in the London International Exhibition of 1874.

Further particulars will be published at an early date.

PHILIPS, DODGE & CO.

Cliff Street, between John and Fulton,
New York, 7th January, 1874.

BADCOCK FIRE EXTINGUISHER CO.

467 Broadway.

GENTLEMEN:—

On Sunday, 29th December, about 5 P. M., a fire occurred at my house, corner Madison Avenue and 37th Street.

The carpet, curtains, woodwork about windows, part of floor, and most of the furniture in the room, were partially or entirely destroyed. The smoke was so dense that it was not possible to throw water from pails with best effect, and the fire would probably have communicated soon to other rooms, but for the timely arrival of a "Badcock Fire Extinguisher," kindly sent from the residence of Mr. Donny, No. 6 E. 38th Street, and another brought by the Insurance Patrol. These two "Badcocks" almost immediately extinguished the flames, and prevented the necessity of using the steam fire engines, which would have damaged greatly the building by water.

As to my opinion of the reliability and efficiency of your machines, I will say that I have since the fire ordered ten (10) for myself and friends.

Yours, truly,

ANSON PHELPS STOKES.

Courier des Dames.

FANCY DRESSES.

In view of the coming Fancy Dress Carnival to be given in this city on the 30th inst., at which H. E. the Governor-General is expected to be present, a few hints as to fancy costumes may be welcome to our lady readers. To those who may be unable to attend the carnival, these suggestions, together with others already made in this column, will be useful for future reference.

At a fancy ball given recently in Hampshire, of which an account appears in the *Queen*, the dresses were exceedingly pretty. The occasion of the ball was the marriage of the Lord Lieutenant of the County. The bride was dressed as a lady of the French Court, in a yellow satin over-dress picked out with blue, a square-cut low bodice, having a large plait at the back; her hair was powdered, and a little velvet hat was perched on the side of her head. Miss F. W., as Henrietta Maria, was also in yellow satin, with a trained skirt, and her hair dressed very like the portraits of Queen Anne—died it to the head, with curls on the forehead, and pearls intermixed with the hair at the back. Mrs. C. appeared as Unlinc; her hair, very much frizzed, was powdered with gold dust, and hung about her shoulders, with forget-me-nots in it, and water lilies; her dress was white. Miss A. in a powdered dress, a black velvet skirt, and a yellow brocade body and tunic, cut square; red rose and black velvet in the hair. There was a great preponderance of powder-dresses among the prettiest of these, was a quilted satin petticoat and a blue upper skirt, and pink and blue roses in the hair. An old lady wore a becoming black Puritan dress, with a high Norman cap. Miss R. went as a Bohemian Fish girl, with a basket slung at her back, and a red cloak. Miss W. appeared as a Witch in yellow and black, with an owl on her shoulder, a sort of steple-crowned hat on her head, and a sceptre in her hand. Miss H. appeared in a costume de chambre of the time of Marie Thérèse, in a black silk dress trimmed with gold antique velvet, scarlet petticoat, and a cocked hat. Miss J. F. as a Russian Peasant, in a blue skirt and crimson velvet bodice, chemisette and sleeves, and a white silk apron trimmed with crimson and gold, and high Koshnick head-dress trimmed with coins and swansdown. Mrs. T., as Catherine of Aragon, in a trained skirt of white silk with lace, upper skirt of white satin with pearls, and a black velvet bodice and tunic of black moiré trimmed with Houghton lace, pearl ornaments, and diamonds.

A Spanish lady is a most becoming and effective costume. A long black silk dress, much trained behind, open heart-shaped in front, elbow sleeves with ruffles; large black fan; long black veil, gracefully fastened to the head by a very high comb; a rose in the hair and bosom of yellow, red, or pink, as most becoming to the wearer; black satin shoes and black silk stockings, open worked. A black dress is always striking and elegant amongst the mass of bright colours at a fancy ball, and is useful after. The more black lace on this the better. A large cross should be worn for ornament. Spring should wear a white tulle or tulle dress, trimmed with spring flowers, such as daisies, primroses, crocuses, and violets, and a long tulle veil falling over the shoulders. Sometimes a tunic of green gauze or satin is adopted, and then of course there must be some green about the bodice. It is rather pretty to arrange the flowers round the skirt in a kind of lattice work, and to edge the tunic with green grass caught up with flowers. A Gipsy may be dressed in many ways. If you take a modern Gipsy, the correct dress would be a dark print or linen, a check cotton apron, and a bright coloured handkerchief over the head; but at fancy balls something more ornamental is usually preferred; for example, a flowered chemise tunic, topped with scarlet bows over a scarlet quilted satin petticoat, a scarlet fringed handkerchief for head-dress; or a short skirt of crimson, with an upper tunic and bodice of black velvet, worn over a pale cambric chemisette, a tulle-trimmed suspended on gold chains to gold armlets, and a bright-coloured scarf attached to the shoulders, and knotted together at the back, so as to fall on the dress. A Water Nymph would wear a white dress of plain or frosted tulle, trimmed with seaweed, which has to be represented by shiny grass mixed with shells and coral; a trimming of this should go round the bodice, and a few shells dotted about a long tulle veil floating at the back is an improvement.

Another pretty costume is a Russian peasant woman's gala dress. It consists of a short skirt, either of white muslin trimmed with black velvet or some bright-coloured marino. A red skirt would look well, with bands of green velvet, headed by black and gold ribbon. The bodice of velvet cut square, having only shoulder straps, displaying a full white Garibaldi underneath, with long sleeves to the wrist. Broad bands of trimmings are laid on across the body, and the waistband has gold braid on it. The head-dress can either be a black velvet toque, with bright ribbon streamers, or the shape of a Scotch cap, with straight pieces of ribbon put down it, and a piece round the border. Scarlet or green stockings and high-heeled shoes, and red beads by way of ornaments. The following is a description of a Russian peasant's dress recently worn at a fancy ball in England: Blue silk skirt, crimson velvet bodice, white chemisette and sleeves, white silk apron trimmed with crimson and gold, high head-dress (the Koshnick) with blue ribbons, and trimmed with coins and swansdown. The following is a tasteful Spanish dress: Short white satin skirt, with great velvet about it; low-bodied sonnet jacket of grenat velvet, with long sleeves fitting the arm tightly, and ornamented with gold ball fringe; high Spanish comb, and voluminous black veil. Catherine of Aragon is another favourite char-

acter. The dress should be as follows: Long trained skirt of black velvet, front breadth of white satin, trimmed with pearls and black velvet; bodice low, square, with white satin stomacher; the hair slightly rolled back from the face, the head-dress black velvet and pearls, rather of the Marie Stuart form; a black gauze veil floating at the back.

Here is a queer matrimonial advertisement taken from the *Independence Belge*:

"A young man, 30 years of age, possessing a fortune of 100,000 francs, and occupying an honourable position in a public office which brings him 5,000 francs, wishes to marry a young lady or a childless widow in a similar position to his own. He would prefer a lady who is slightly lame. The peculiarity of this advertisement will be explained on addressing, Poste-Res-tante, Brussels."

The *Warehousmen and Draper's Journal* says: "Handkerchiefs have been subjected to all kinds of metamorphoses lately. There have been the unbleached lawn handkerchiefs for ladies trimmed with *feru lace*, the white cambric ones with wide coloured hems, both for ladies and gentlemen, and others for the latter only in linen, surrounded with stripes of two or more colours, mauve and yellow, chariot, pink, and yellow; also silk handkerchiefs, with white *feru* or light tinted centres, and bright-coloured hems in blue, scarlet, violet, or chariot; but the greatest novelty of all are the new autograph handkerchiefs; these are made all white or with tinted borders, and have embroidered in colours in one corner, the exact facsimile of the owner's signature. This charming innovation, which has only just made its appearance, bids fair to become quite the rage."

The *Express* says: "It has often seemed to us hard that the medical profession should have exclusively to bear the brunt of invasion by ambitious ladies, who, not dissatisfied with the sphere of duty usually assigned to them by convention if not by nature, it is not therefore without some sense of gratification that we hear that the Bar is now about to be assailed. We are informed that a lady has applied, or is about to apply, to the Benchers of the Inns of Court, with the intention of keeping terms for the Bar. Our own main objection to ladies entering the medical profession is that it is limited to them. We shall have others to say how far the Bar is likely to afford field for the exercise of female talents. We can imagine such fair counsel producing a mighty effect on juries in cases of breach of promise. And yet this is just the kind of case in which the lady barrister would feel bound to suppress the feminine side of her nature, and speak like a man. One thing is clear, however, that it is quite logical for enterprising ladies to pass from one claim to another. They cannot stop at the medical profession. The Bar and the Pulpit, and even the Bench of Bishops, must look out, and both Houses of Parliament may have to be contented with a view to more sitting accommodation."

The *Hampshire Independent* has the following under the heading of "A New Phase of Women's Rights": "At Godalming there has been established a 'Women's Free and Easy.' The local is the classic hostelry the Half Moon, where every Tuesday evening the front parlour is occupied exclusively from midday seven to eleven o'clock by the fair sex, both married and single. Each member—at present there are twenty-five—takes the chair in rotation, the principal duties of the chairwoman being, as we are informed, to keep the 'charmony going,' to 'rap down' the choruses, to call for the toasts, and to maintain order, while the subscriptions—entwopence weekly—are received by the appointed secretary, a Mrs. Morris. During the progress of each song, each 'chuck' calls for what refreshment she feels disposed to take, and the use of the 'fragrant weed' is not, we believe, disallowed. It is intended to devote the subscriptions once a quarter to a 'tea supper' or 'meat tea' when the members will attend in full force. So popular has this 'free and easy' movement become for the men have one at the same place on Monday nights, and are thirty-five strong—that an enlargement of the premises of the Half Moon has been resolved upon.

A STATE RULED BY WOMEN.—Among the Holland possessions there is a remarkable little state, which, in its constitution and the original customs of its inhabitants, surpasses the noblest dreams of American emancipation ladies. Upon the island of Java, between the cities of Batavia and Samarang, lies the kingdom of Giamoi. Although tributary to Holland, it is an independent state, politically without importance, yet happy, rich, and since time immemorial governed and defended by women. The sovereign is indeed a man, but all the rest of the government belongs to the fair sex. The king is entirely dependent upon his state council, composed of three women. The highest authorities, all state officers, court functionaries, military commanders and soldiers, are, without exception, of the female sex. The men are agriculturists and merchants. The body-guard of the king is formed of the female *Alte*. These amazons ride in the masculine style, wearing sharp steel points instead of spurs. They carry a pointed lance, which they swing very gracefully, and also a musket, which is discharged at full gallop. The throne is inheritable by the eldest son, and in case the king dies without issue, a hundred elected amazons assemble in order to choose a successor from among their own sons. The chosen one is then proclaimed lawful king. The capital city of this little state lies in one of the most picturesque parts of the island, in a fruitful plain, and is defended by two well-kept fortresses.

Jacob's Rheumatism Cure. A Numbness.