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SCIENTIFIC AMERICAN SUPPLEMENT

No. 674.

For the Week Ending December 1, 1888.

Price 10 cents. For sale by all newsdealers.

TALL CHIMNEY ENGINEERING.

Some very striking examples of the resources of engineering have been furnished by the treatment of tall chimneys, in some cases the tragic side of the profession coming into relief. The problems presented for solution by these structures are difficult. It often happens that a chimney settles a little on one side, and becomes dangerously inclined from the perpendicular. In such a case it has to be straightened. Sometimes the operation is successful, but in a number of instances the chimney has fallen after the operation.

Probably the worst of these accidents on record happened in the case of Newland's mill chimney, Bradford, England, a shaft rising 260 feet from the top of the foundation. When it was nearly completed, it was found to be bulged on one side and hollow on the other. The settling occurred during a single night. To straighten it, two cuts were made extending about one-half around it, which, as fast as made, were filled with stone one-half inch less in thickness than the cut. Iron wedges were driven above the new stone to take the weight. The cuts were made little by little, so that no change occurred until the wedges were knocked out. The chimney then settled down on the side where the cuts were, and was straight. It was then completed. Nine years later some cracks appeared and were repaired. Again, after ten years more had elapsed, some pieces of the outer casing dropped off, and two days later the whole upper portion of the chimney fell, killing fifty-four persons and doing about $100,000 worth of damage. Just before the collapse stones and mortar were observed to burst out from the locality of the cuts.

In the neighborhood a successful operation of the same character was performed. A chimney at Bingley, near Bradford, was found to be four feet six inches out of perpendicular. A gap a foot high was cut clear through one side of it. Screw jacks were inserted in the cut as fast as the cut progressed, and as each was put in place it was screwed up hard against an iron top plate. A similar plate was placed under each jack. When about half the circumference of the chimney was cut through, the jacks were slowly turned down until the chimney was nearly straight. The gaps between the jacks were bricked up, the jacks were taken out one by one, and masonry was put in their place. When all were removed the shaft was perfect, the compression of the new work having completed the straightening.

In another instance a chimney 132 feet high settled until its top was 3 feet 2 inches out of the perpendicular. This was at the works of Matthews & Sons, in Gloucestershire. A course of bricks was taken out for five-eighths of the circumference and replaced by a course 1⅝ in. less in height. As fast as the cut was made the new course was laid and iron wedges were driven in above it. When all was in place, the wedges were driven out, and the chimney came back to within an inch or two of the perpendicular.

Chimneys will stand these operations if of good material originally; but if the brick and mortar are inferior, they will be apt to succumb. A shaft in Oldham was being straightened in the above manner. The owner protested, taking the ground that the mortar should alone have been sawed, and went off a little distance with one of the workmen to observe it, when suddenly the pile fell, burying one man in the bricks and destroying an adjacent building. The brick and mortar were both of inferior quality.

It is by no means the universal custom to treat the problem in so radical a manner as by the removal of a portion of the bricks or stones. Often the mortar between two of the courses of brick is sawed out on the higher side and the operation is repeated on the other joints until the work has been completed.

The moving of a chimney has been successfully accomplished. In Brunswick, Maine, a seventy-eight foot chimney was moved twenty feet on greased planks. It weighed about 100 tons. Inside of nine hours it was again at work in its new position, receiving the products of combustion from the fires.

The erection is generally conducted by the ordinary methods in use in regular building. Sometimes a radical departure is made. An iron chimney over 150 feet high has been built from the bottom upward. A section of the chimney twenty feet high was first built. This was raised vertically four feet, and a circle of plates four feet high was riveted to it at the bottom. The whole section, now twenty-four feet high, was lifted again four feet, and a new course was riveted on, and this was continued until the whole was complete. A hydraulic ram did the lifting. Of course this method could not well be applied to other than a sheet iron shaft.

In the demolition of a high chimney some ingenuity can be shown. A chimney in Middlesborough, England, was taken down brick by brick from the top downward. A long chute one-half an inch longer and wider than a brick in its cross sectional dimensions was first erected within the flue. It was air tight and rose from an air tight box placed at the bottom of the chimney. The bricks were dropped one by one through this chute, and were cushioned by the air so that none were broken or injured. From time to time the box was opened and the bricks that had accumulated were removed.

THEATRICAL EMOTION.

Who, sitting at the play, has not wondered if those portraying passion were not moved at their counterfeit presentment—so real it seemed. There's the man in a passion, actually red in the face and trembling visibly; the mother weeping over her child. How true it seems! If she be not crying, there is every evidence about her of profound grief. See how she throws up her arms as though appealing to the heavens for aid; watch the muscles of the face, the expression of her eyes, and note the depth of feeling in that sigh she fetches. Is all this but simulation? So it has often been alleged; only theatric trickery. Now, however, comes a medical authority who insists that no one can simulate passion truly without feeling it—at least to a certain extent. He says that the players themselves will sustain his assertion—the best proof of all being that, from the earliest days of their apprenticeship, they were bidden to imagine themselves the personages they would counterfeit.

Any one who has ever been before the footlights when a company was being drilled will remember the frequent recurrence of such remarks as these by the stage manager: "Mr. Jones, you're not feeling the part, you're only acting it. No man ever looked as you do when he was really mad. Miss Smith, you would not cry in such a happy-go-lucky fashion, were you really cast adrift on a deserted island. Try and imagine such a condition; think of your forlorn state, the fact that you are not likely to see home and friends again. Perhaps you will starve, or be eaten by wild beasts when night comes"—and so on.

Another authority, in a recent paper on the subject, takes the opposite view, insisting it is all mechanical. He says: "By long practice we are enabled to intervene between the psychological and the muscular or vascular conditions. Our social education accustoms us, from infancy upward, to the exercise of some sort of control over the exhibition of the emotions, and to the well-trained individual it is comparatively easy to prevent his face divulging his thoughts and feelings. In the same way actors gradually become enabled to tear a passion to tatters without showing the emotion to which their mimicry gives rise in the onlookers. An actor who really wept or really laughed would be as little fitted for his task as a medical man who really experienced the sympathy which his speech and manners are intended to convey. Not that there is anything hypocritical in either case, but both have acquired the ability to disassociate the feeling from its normal manifestations. From a theatrical point of view, it is surprising what education and practice can do toward converting into voluntary acts phenomena which, in other people, are utterly beyond the sphere of the will."

NEW ANIMALS AND BIRDS IN THE CENTRAL PARK.

The leather turtle, newly come to the Central Park collection from southern Texas, is so rare that none has been shown here before, and so curious as to well repay a visit to the pigeon house, where, in the little pool, he lies for hours blinking lazily; the birds coming down to its edge to drink keeping one eye on the dull, sodden-looking creature, with vampire-like beak and telescopic neck. A keeper brought him into Superintendent Conklin's room one afternoon last week, and as he made off for a dark corner, his back—he is about eighteen inches long—moved in rhythmic waves with every movement. Instead of shell and bone, like other turtles, it is elastic and ductile. Indeed, you can almost double him up, even the frame seeming more like cartilage than bone. He is said to be as toothsome as green turtle, is found in fresh water, and was given to the Park by Mr. J. W. De Peyster.

There are now a pair of wild Barbary sheep (*Obis trangelaphus*) in the inclosure near the Arsenal. They are very young, but when full grown will be quite as large as Rocky Mountain sheep, standing about four feet high. The wool is fawn-colored and short. The ram has a great mane, and his fore legs well feathered. The horns are long, heavy, and curving.

A South American deer of the red variety was recently given the Park by Dr. Spitska.

There is a cow blackbird in the bird house, brought to this port by a ship of the Hamburg line of steamers. When the ship was fully 800 miles off the coast, this bird flew aboard during a November storm. It seemed utterly fagged out, alighted first on the main truck, and then, as if its strength was near gone, almost tumbling down the yards to the deck, where it lay feebly fluttering.

A large rough-legged hawk from the Rocky Mountains (*Archibeuto Santi Johannes*) has been given by Dr. Francis Martin, of Boston. It was taken from its nest by the Indians, and is said to be a rare specimen.

Only three elephants remain, and these are kept chained to the hard floor of the antelope house. So nervous this unnatural imprisonment has made them, that now and then one or the other shows signs of dangerous excitement. One afternoon last week, when the doors were closed, Snider, the elephant keeper, unchained the biggest of the three, a monster elephant, standing 9 feet 1 inch high, weighing nearly five tons, and second in size only to the late Jumbo. This partiality so angered Tom, one of his mates, that he set up a vibrant trumpeting, jumping up and down angrily, and thrashing his trunk this way and that. A night or two before, he tore his iron-girdled, oak-framed cage to pieces, twisting and breaking the bars of inch iron as though only saplings. So ugly has he come to be, that it will probably be necessary to build an iron cage of double thickness for him.

POSITION OF THE PLANETS IN DECEMBER.

VENUS

is evening star, and heads the December list. Her size and brilliancy increase with every reappearance, as she treads her eastern path, and proves herself worthy of her title—the fairest of the stars. She will be near the moon on the evening of the 5th, star and crescent forming a charming celestial picture in the southwest. At the close of the month she sets more than three hours later than the sun. Venus sets on the 1st at 6 h. 46 m. P. M. On the 31st she sets at 7 h. 55 m. P. M. Her diameter on the 1st is 13".8, and she is in the constellation Sagittarius.

SATURN

is morning star, and takes the second rank on the monthly annals, for at the close of the month he will rise in the east about a quarter of an hour before Venus sets in the west. He may be known by his vicinity to Regulus, being on the 1st about 7° northwest of the star. Saturn rises on the 1st at 9 h. 44 m. P. M. On the 31st he rises at 7 h. 41 m. P. M. His diameter on the 1st is 18".8, and he is in the constellation Leo.

MARS

is evening star. The rapidly lessening distance between this planet and Venus is the interesting feature of his progress during the month. The two planets are 15° apart on the 1st, and only 1° apart on the 31st. Mars shins as a dim, ruddy star, northwest of Venus. He makes a close conjunction with the moon on the evening of the 6th, being 15′ south. Mars sets on the 1st at 7 h. 59 m. P. M. On the 31st he sets at 8 h. 1 m. P. M. His diameter on the 1st is 5".6, and he is in the constellation Capricornus.

NEPTUNE

is evening star, and in his best position for telescopic observation. He may be found about 5° southeast of the Pleiades. Neptune sets on the 1st at 6 h. 16 m. A. M. On the 31st he sets at 4 h. 15 m. A. M. His diameter on the 1st is 2".6, and he is in the constellation Taurus.

URANUS

is morning star. A telescope will bring him into view about 3° north of Spica. Uranus rises on the 1st at 2 h. 54 m. A. M. On the 31st he rises at 1 h. 2 m. A. M. His diameter on the 1st is 3".4, and he is in the constellation Virgo.

MERCURY

is morning star until the 28th, when he is in superior conjunction with the sun, and takes rank among the evening stars. Mercury rises on the 1st at 5 h. 57 m. A. M. On the 31st he sets at 4 h. 31 m. P. M. His diameter on the 1st is 5".2, and he is in the constellation Libra.

JUPITER

is evening star until the 8th, and then morning star. He is in conjunction with the sun on the 8th, and so closely hidden in the sunbeams that he is of little account during the month. Jupiter sets on the 1st at 4 h. 46 m. P. M. On the 31st he rises at 6 h. 8 m. A. M. His diameter on the 1st is 30"., and he is in the constellation Scorpio.

Mercury, Venus, Mars, and Neptune are evening stars at the close of the month. Jupiter, Uranus, and Saturn are morning stars.

PHOTOGRAPHIC NOTES.

Toning Blue Prints.—President C. W. Canfield, of the New York Society of Amateur Photographers, recently gave the following simple formula for toning blue prints, which he had taken from a French journal.

Make a solution of:

Borax	70 grammes.
Water	1100 c. c.

Add sulphuric acid in small quantities until blue litmus paper is turned slightly red.

Then add a few drops of ammonia until the alkaline reaction reappears and red litmus paper is turned blue. Lastly 10 grammes of red crude gum catechu is put into the solution and dissolved, occasionally stirring with a glass rod.

The prints should be printed a shade darker than is desired, and are then toned by immersing in the bath for about five to ten minutes, or until the color has changed. The blue changes to a dark olive green, which in the daytime has all the effect of black. The toning bath will keep indefinitely. Gum catechu can be had at any drug store, and in chemical composition is nearly 50 per cent tannin.

Toning Bath for Gelatino-Chloride Paper.—The following modification of a toning bath has been given by W. H. Stebbins, Jr., of the Amateur Photographers' Society of this city:

No. 1.

Acetate of soda (fused)	40 grammes.
Sulphocyanide of ammonia	20 "
Water	1000 "

No. 2.

Chloride of gold	1 gramme.
Water	1000 "

For use add to 200 grammes of solution No. 1, 60 grammes of No. 2.

Both solutions should be kept separate until used. Heretofore part of the gold solution has been mixed with the sulphocyanide solution, but the improvement consists now in keeping the gold by itself and adding the sulphocyanide directly to the acetate solution. The solutions keep better when prepared as described, and the toning commences as soon as the prints are put in the bath, producing in a few minutes —not over ten—beautiful purple tones.

Professor Tuson.

We regret to announce the death, at the age of fifty-six, of Prof. Richard Vine Tuson, who for the last twenty-eight years has held the post of Professor of Chemistry in the Royal Veterinary College, London.

Prof. Tuson began his scientific training under Prof. Graham, at University College, and was afterward assistant successively to Prof. Ronalds, in Galway, and Dr. Stenhouse, at St. Bartholomew's Hospital, in London. He was afterward elected Lecturer on Chemistry to the Medical School of Charing Cross Hospital, where he was universally popular with students and teachers. A few years later he tried for and obtained the professorship which he held until his death, which took place, in his house at Erith, on the 31st of October, 1888.

Prof. Tuson was a thorough chemist and an able teacher and experimenter. Various scientific papers stand in his name, but his most important literary labor was the new edition of Cooley's well known "Dictionary of Receipts," which he prepared with care and skill. He was a good and most amiable man, and his untimely death, from heart disease—which, it appears, had been making unsuspected progress in his system for years—will be lamented by a wide circle of friends. —*Chemical News.*

Electric Wires in New York.

In a paper read before the National Electric Light Association, Dr. Schuyler S. Wheeler, electrician of the Board of Electrical Control, says the total number of miles of underground wires already laid in New York is 3,697.

The number of miles of underground wire in Brooklyn is 2,100.

The number of miles of underground wire in Paris is 4,100.

The number of miles of underground wire in Chicago is 200.

The number of miles of underground wire in Boston is 400.

The number of miles of underground wire in Pittsburg is about 1,000.

There are already underground, in the city of New York, more electrical conductors than in any other city in the world (except Paris), while the capacity of the subway construction already finished in this city may be estimated fairly at something over 30,000 miles of conductors.

There are through lines completed from the Battery to the Park on the two principal thoroughfares of this city, Broadway and Sixth Avenue, and a gradual conversion of overhead lines to underground lines in the busy parts of the city may be confidently expected.

The Board of Electrical Control is not unmindful, however, of the magnitude of the labor and expense required in converting the present arrangements into underground systems, and does not contemplate either the hampering of the business of electrical companies by forcing unreasonable numbers of wires underground, or by attempting to compel the use of subways faster than is consistent with the efficiency of the various electric service to the public. If the great mass of overhead conductors are removed, and the remainder of the service brought to a condition which will insure the safety of the public, and, at the same time, the benefit of the companies themselves, it will be the result desired by the people of the city, and which the Board of Electrical Control is endeavoring to attain.

As to this matter of regulating the overhead service in the city, I may say that an investigation of all the wires overhead, instituted since I have been connected with the work of the authorities in charge of electrical matters here, by the inspectors appointed after a rigid examination, found competent for the purpose, has shown that a great deal of very bad and unnecessarily dangerous work has been done in New York, and that a reprehensible and inexcusable condition of overhead wires is the principal, if not the only, cause of the clamor for underground service.

In addition to this, an enormous quantity of wire and a large number of poles not in use at all exist, amounting, as has been variously estimated, to from a half to two-thirds of all the wire and poles in the city.

One has no idea of the aerial freebooting that is and always has been going on with overhead wires, until he spends some time seeing what there is overhead. The condition of wires in this city is simply outrageous.

The companies owning wires will not permit each other to make common use of the poles, but will chop off wires owned by others without notice. The telephone people object to the electric light wires on account of the induction. Where there is a line of light wires on their side of the street passing close to their poles, they will not allow them to be made fast. The result of the necessity thus made for extra poles is sometimes four lines of poles on one side of the street. Hence most of the wires swing close to or against the other poles to which they are not attached, and linemen, in climbing them, have to crawl through all the other wires which are not fastened to cross-arms.

Among the cases of dangerous wires and unnecessary obstructions found by the inspectors are full lines of large poles extending over miles of streets, filled with wires which are "open" and out of use, but left standing to save the expense of removal, long lines of poles left standing to preserve right of way, arc light day circuits within reach and with the insulation dropping off, and bunches of dead wires hanging from house tops, etc.

Testing Amber Varnish.

Commercial amber varnish is made by dissolving amber or colophony amber in linseed oil, varnish, and turps. In many cases it is made without the expensive amber, and an analyst is sometimes asked his opinion, whether a sample is genuine, viz., really made with amber. The best way is to try for succinic acid, although even a genuine article only contains small quantities of this substance, as a large quantity volatilizes during the heating of the varnish. The detection is, however, difficult, owing to the nature of the article. Neither boiling with hydrochloric acid nor treatment with alcoholic potash extracts any succinic acid. The author's plan is to treat the sample with nitric acid of 1·20 specific gravity.* He proceeds as follows:

Twenty grms. of the varnish are put into a flask of about 300 c. c. capacity, and heated on a sand bath with 50 c. c. of the nitric acid. When action sets in, the flask must be somewhat cooled to prevent a too fierce oxidation, when it may be again gently heated for about fifteen minutes. The acid, which holds all succinic acid in solution, is now poured off and the insoluble resinous mass washed with water. The acid is evaporated in the water bath, a little water being from time to time added. When the acid has been completely expelled, the remaining sirup is dissolved in about 10 c. c. of water, and this solution shaken with 100 c. c. of ether. After distilling off the ether, the residue is put in a watch glass and put under a desiccator. After about twelve hours, crystals of succinic acid separate out, and the amount gradually increases. The mother liquor being removed by means of blotting paper, the crystals may now be tried by the usual tests for succinic acid. It is thus possible to answer within twenty-four hours the question whether a sample of amber varnish is really deserving of the name.—*W. Sonne, Zeitschr. f. angew Chemie, No. 18; L. De K., The Analyst.*

Electro-Plating.

The following method for the electro-deposition of the heavy metals, such as platinum, iridium, palladium, etc., has recently been proposed by Professor Silvanus Thompson. The impure metal is first obtained as a chloride by the ordinary chemical processes. The excess of acid is evaporated off in a water bath, and the salt finally redissolved in distilled water and from ten to fifty times its weight of a solution of sodium phosphate either pure or mixed with borax. The solution is then raised to the boiling point, and sal ammoniac, common salt, or sodium bromide added. The solution is then reheated, and finally neutralized with either the carbonate or, if alkaline, with the bicarbonate of soda. In depositing the metal from a bath of the above solution, it should be heated to from 60 deg. to 90 deg. Cent., and the metal deposited in the ordinary way. In the case of platinum, a brilliant deposit can be obtained from a bath of the following composition:

	Parts.
Chloride of platinum	2
Sodium borate	16
" carbonate	16
Sal ammoniac	2
Water	150

* Note by abstractor.—May not some succinic acid be actually produced by oxidation of fatty matter?—L. De K.