SCIENTIFIC AMERICAN

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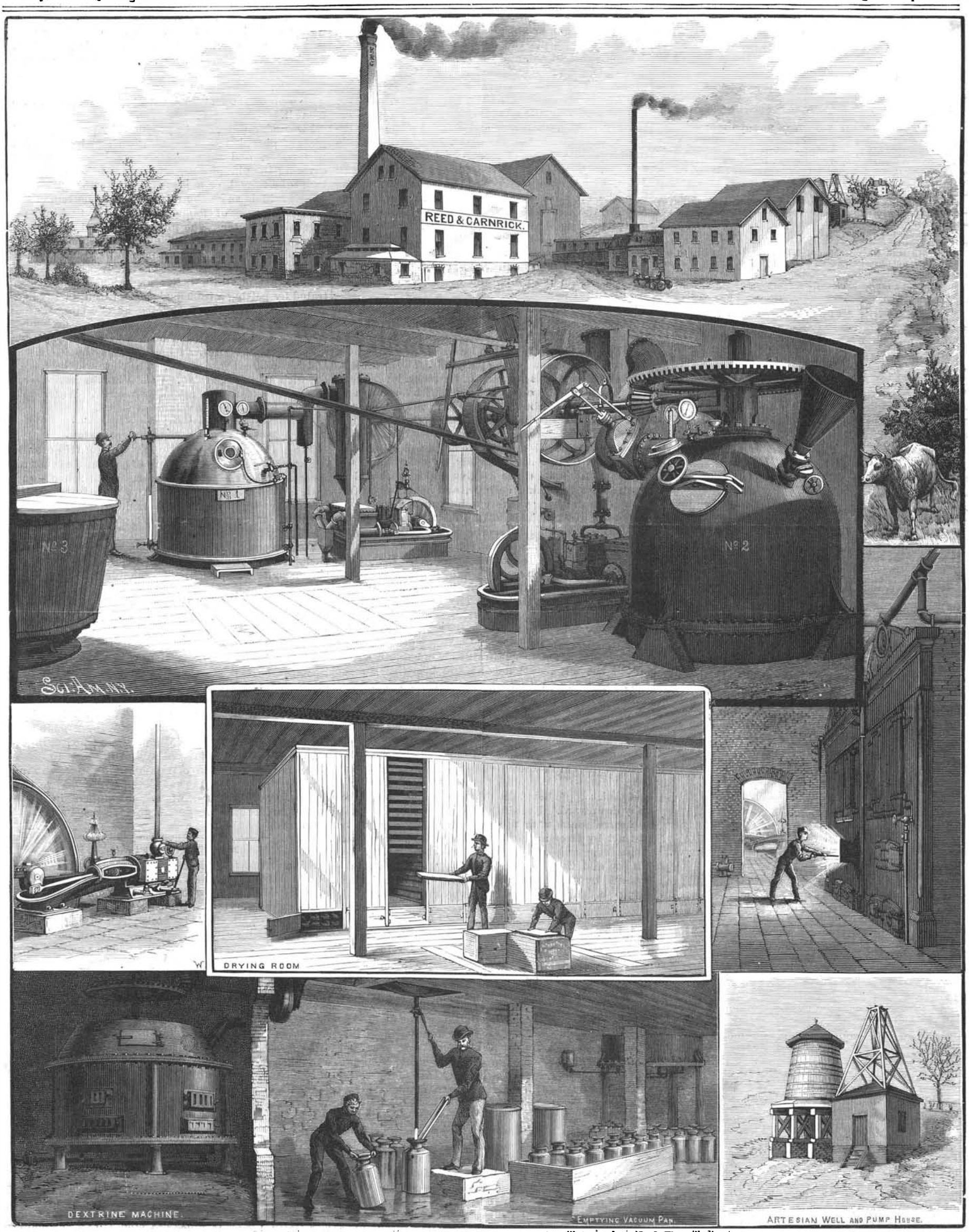

No. 1. Condensed milk vacuum pan, No. 2. Vacuum pan for reducing the milk to powder. No. 3. The milk digester.

THE REED & CARNRICK FOOD LABORATORY AT GOSHEN, N. Y.—[See page 213.]

Scientific American.

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NEW YORK, SATURDAY, APRIL 7, 1888.

Contents.

(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 640.

For the Week Ending April 7, 1888.

Price 10 cents. For sale by all newsdealers.

TREES AND FLOWERS IN THE CENTRAL PARK.

The long rain having ceased and the chill of winter being gone from the air, there is now a deal of activity in and about the greenhouses of the Central Park. Men are potting plants and setting out daisies and pansies already in bloom; geraniums, violets, mignonettes, are at last getting a breath of fresh air in forcing beds, the frames being raised. The bluebirds are sounding their cheerful notes, evidently satisfied that spring has really come. Preparations are now making to set out the coleus, whose leaves with their yellow and red and brown and green markings are fairly well grown. Other ornamental foliage plants will follow, such as the *Solunum warscewiczoides*, which grows to a height of six feet, the *Alternauthera*, of variegated purple, the *Gnaphalium*, the *Acalypha*, of bronze, bright red, and yellow.

In the lily house, that beautiful purple African water lily, *Nymphia zanzibarensis*, is almost in full bloom, and will be set out toward the last of May in all the city parks. The Nile lotus is sprouting from its tub in the lily pond, 75th Street and Fifth Avenue. In the propagating houses the wax plant, *Hoya carnosa*, is in full bloom—its bunch of star-shaped flowers of a rich crimson. Then there is the curious artillery plant, *Pilea*, whose masses of pollen, now matured, spring into the air when sprayed with water; the sky-blue *Ruellia*, the crocus-yellow *Stephanotis*, the insectivorous pitcher plant, *Sarracenia*, which lives on the insects it attracts and holds by the sweet, viscid liquor exposed along its edges. It has a large purple-green flower, and blossoms in June. Then there is the Texas dwarf rose, pinkish-white, and dahlia, calla lily, and the beautiful narcissus.

Outside, on the side of a neighboring hill, the writer was shown some snowdrops in bloom, sheltered from the wind by a rift of snow, and crocuses, it is said, are peeping up through the thin layers of snow that here and there speck some of the park hills. The rock cress, *Arabis*, that clusters on many of the rocks, looks green and thriving, and soon will be white with flowers; and the moss pink is in bud. The English heather on the hills is covered with its little pink-white buds.

Many of the perennials, put out last autumn, such as tulips, daffodils, scillas, and so on, are beginning to show signs of life—some already above ground. On the hazelnut bushes, the catkins and aments of last autumn are fresh and springy, and need only a few days of warm spring weather to burst into flower.

The dogwood and scarlet maple trees are late in budding this year, for Superintendent-Gardener George Woolson says so severe a winter has not been seen for seventeen years. The birches, *Betula*, look the hardy trees they are, the long and drooping catkins are visibly swelling and ready to burst into their yellow bloom. They are less backward than any other of the park trees, being seemingly impervious to winter's severest storms, nor is this strange when we remember that the birch is found growing on highest Alpine peaks, having pressed ahead of all others in altitude of habitat, and is indeed the only tree that is able to bear the rigors of the icy North, or rather it grows further north than any other, there being scarcely any other in the whole of Greenland. The weeping birch, *B. pendula*, by long odds the most beautiful of all the birches, is quite as far advanced as the commoner variety. Here and there upon the hills they stand like sentinels, and, because of their milk-white bark, can be distinguished at long distances. Soon their fragrant leaves will develop and their supple boughs and branches tapering gracefully downward. The alder, which Linnæus classes in the same genus with the birch, but looked upon as distinct by later authorities, is in vigorous condition —this being true of both the heart-leafed, *cardifolia*, variety and the common, *glutinosa;* its buds as examined by the superintendent-gardener last week being in quite as good condition as usual at this time of the year. The curious pin oak seems backward, and its pendulous boughs have not yet their wonted suppleness. The Austrian pines are in bloom, the cones ear-dropped and springy. The China elm from the Caucasus, almost an evergreen, looks as if winter had not yet come, and the greatest rigors could not dim its coloring. The beautiful, wide-spreading beeches, of which the park contains a large number, are visibly showing the effects of spring, but, because planted so near together, have little chance for vigorous life. This tree, even under favorable conditions, does not do as well here as in Europe, notably in England, where the Burnham beeches have attracted universal attention because of their growth. A new system has lately been adopted at the park for preventing heavy trees, divided into two toppling parts, from splitting. Heretofore, the system was to fasten an iron band under the crotch—a pernicious system, be it said, because leading to what might be called strangulation; for the growth of a tree takes place from the inner bark, or cambium layer, a name given to the viscid mucous secretion interposed between the wood and bark, and contained in delicate forming and growing cells. The new mode is to run an iron bolt through the trunk at the notch, with washers and nuts at either end, and it is said this is not in any wise injurious. No means has yet been found to stop the ravages of the elm beetle, which last year did a great deal of mischief, wholly consuming the leaves of many of the elms, and at times attacking other trees.

How to Light a Lamp with a Snowball and the Like.

The *National Educator* gives the following three curious experiments, which may not be new to the professional chemist, but will be of interest to the chemist student.

When a small piece of potassium, the size of half a grain of corn, is dropped into a tumblerful of water, some of the oxygen of the water leaves its hydrogen, owing to the intense heat which the chemical action produces, and combines with the metallic potassium, causing a violet bluish flame. When the piece of potassium is placed on the wick of a coal oil or alcohol lamp, the flame produced by touching the potassium with a bit of snow or ice or a drop of water will inflame it.

Fire under water can be produced by placing a small piece of phosphorus in a conically shaped glass filled with water, and some crystals of chlorate of potash covering the phosphorus, and then pouring through a long tube funnel, or a glass tube, a few drops of sulphuric acid down on the mixture at the bottom of the glass. Tongues of flame can be seen flashing up through the water. The intense chemical action produces sufficient heat to inflame the phosphorus under the water. Where there is sufficient heat and oxygen fire will burn, whether in air or water.

The force of steam boiler explosions can be illustrated by getting a tube made by a tinsmith, say half an inch in diameter, and closed at one end. Put a piece of ice the size of a cherry, or half a teaspoonful of water, into the tube and cork the open end tightly. Suspend the tube over a flame, so that the ice melts and is converted into steam. The cork will be forced out with a loud explosion. Candle bombs held over a flame will explode in a similar manner. Water will produce 1,700 times its volume of steam.

Dangers of Insufficient Ventilation.

One of the great evils of civilization lies in the crowding together of large numbers of persons in confined spaces. This is especially the case with schools and with factories, but is not limited to those instances. It has always been known that such crowding was unhealthy, but the exact amount of evil resulting is necessarily difficult to estimate.

Very recently Brown-Sequard has proved by actual chemical analysis that the air expired by a healthy person contains a poison, not a microbe, but a distinct chemical poison.

In factories, as usually arranged, there must inevitably be much evil done by the breathing of other people's breaths all day long, six days in the week. Brown-Sequard considers it a principal cause of consumption.

The only remedy lies in effectual ventilation, and there can be no doubt that in factories, schools, and all other places in which many persons live and work or study in confined space, the ventilation should be much better than it is. In some factories the air is so bad that persons unaccustomed to it are rendered faint. What, then, must be the effect on those who live in it?

I would wish, therefore, to appeal urgently to those who have the direction of schools and factories to introduce really effective ventilation. They have the health, even the lives, of large numbers in their charge, and cannot escape this great responsibility.

M. C. L.

Hot Water for Plants.

It is a fortunate circumstance that a plant will endure a scalding heat that is fatal to most of its minute enemies. Water heated to the boiling point, poured copiously over the stem of an enfeebled peach tree, and allowed to stand about its collar, will often have the happiest restorative effects. Trees showing every symptom of the yellows have often been rendered luxuriantly green and thrifty again by this simple means. The heat is presumably too much for the fungus which had infested the vital layers of the tree, immediately under the outer bark.

The London florists recommend hot water, up to 145° Fah., as a remedy when plants are sickly, owing to the soil souring—the acid absorbed by the roots acting as a poison. The usual resort is to the troublesome job of repotting. When this is not necessary for any other reason, it is much simpler to pour hot water freely through the stirred soil. It will presently come through tinged with brown. After this thorough washing, if the plants are kept warm, new root points and new growth will soon follow.

A lady friend had a fine calla in a three-gallon pot, which showed signs of ill health. On examination the outer portion of the filling was found mouldy, it being in large part fresh horse manure. As repotting was inconvenient, the plant being in flower, hot water was freely used. It killed the mould, and the plant began to revive and was soon all right.—*Vick's Monthly.*

POSITION OF THE PLANETS FOR APRIL.

MARS

is morning star until the 11th, when he becomes evening star. He will be a beautiful object throughout the nights of April on account of his ruddy light, brilliancy, and the warlike aspect to which his name is due. His approach to Spica, his bright companion, will be plainly perceptible. On the 13th he will meet and pass Spica about 4° north. After that time he will recede from the star. The opposition of Mars, which occurs on the 11th, gives the reason for his present importance among the planetary brotherhood. He is then at his least distance from us, the earth is between him and the sun, and he rises at sunset and is visible the entire night. Mars rises on the 1st at 7 h. 15 m. P. M. On the 30th he sets at 3 h. 59 m. A. M. His diameter on the 1st is 16″, and he is in the constellation Virgo.

URANUS

is morning star until the 4th, and then evening star. He is in opposition with the sun on the 4th, and will be at his best for observation with the naked eye—for those who are blessed with special visual power. If the unaided eye fail to find him, a telescope will bring him out northwest of Spica, and not very far from Mars. He must be looked for in the southeast soon after sunset. Uranus rises on the 1st at 6 h. 28 m. P. M. He sets on the 30th at 3 h. 53 m. A. M. His diameter on the 1st is 3″.8, and he is in the constellation Virgo.

SATURN

is evening star. He is in quadrature with the sun on the 19th, and is near the meridian at sunset. He is stationary about the 1st of the month, and then moves eastward, retracing his path in the heavens. He is easy to find east of Pollux and Procyon, though his brilliancy is lessening as his distance from the earth increases. Saturn sets on the 1st at 2 h. 39 m. A. M. On the 30th he sets at 0 h. 48 m. A. M. His diamater on the 1st is 17″.8, and he is in the constellation Cancer.

JUPITER

is morning star. There is no need of pointing him out to observers of the southeastern sky, at 11 o'clock on the 1st and at 9 o'clock on the last of the month. He is then seen rising slowly above the horizon and treading his starry path with stately step, the most brilliant star in the whole heavens. Even ruddy Mars pales in his presence. Jupiter rises on the 1st at 10 h. 46 m. P. M. On the 30th he rises at 8 h. 42 m. P. M. His diameter on the 1st is 39″.8, and he is in the constellation Scorpio.

VENUS

is morning star. She is still brilliant in the eastern sky in the morning, but her luster grows dim as she approaches the sun. She rises about half an hour before him at the close of the month. Venus rises on the 1st at 4 h. 50 m. A. M. On the 30th she rises at 4 h. 16 m. A. M. Her diameter on the 1st is 11″.6, and she is in the constellation Aquarius.

MERCURY

is morning star. He is in conjunction with Venus on the 13th, at midnight, being 1° 10′ south. Mercury rises on the 1st at 4 h. 48 m. A. M. On the 30th he rises at 4 h. 35 m. A. M. His diameter on the 1st is 7″.2, and he is in the constellation Aquarius.

NEPTUNE

is evening star. He sets on the 1st at 10 h. 6 m. P. M. On the 30th he sets at 8 h. 18 m. P. M. His diameter on the 1st is 2″.4, and he is in the constellation Taurus.

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

The Great Storm.

The recent storm of wind and snow proved fully as widespread and disastrous as the first reports indicated, and some roads were a full week or more in recovering from it. Northern New England did not suffer exceptionally, and trains within 15 miles of Boston were kept running, but otherwise the blockade was as complete as indicated before. The newspapers have printed hundreds of columns of particulars, and have made mention of a great many derailments which will never get into our record, because the accounts are too vague. The New York Central had six or eight trains stalled between New York and Yonkers. Most or all of them were heated from the engine, and the heating systems acquitted themselves creditably, though the snow actually embedded the cars from the windows down. The two inner tracks in the Fourth Avenue tunnel and on the viaduct north of it were badly blocked, and an express train stood near 110th Street from Monday morning till Thursday night, though the passengers got out on Tuesday.

The Boston & Albany had a train, from which the engine had been detached, stalled within eight miles of Springfield for about 46 hours. It contained 160 passengers, whose necessities were relieved by a volunteer party of 40 men, who carried coal and provisions on their backs from the nearest village, two miles or more away. The conductor strove six hours to reach the nearest telegraph office, a third of a mile away, occupying 45 minutes going the last 70 feet. Many other trainmen in various places proved themselves heroes. Near Worcester, on the Boston & Albany, the engine of a steam-heated train, which left it and went for help, was unable to return, and the newspapers say that blankets for the passengers had to be carried from the city by horse power. A Shore Line express train was detained near Saybrook, Conn., 53 hours.

The New York, New Haven & Hartford had about the hardest fight of all, the New York & New Haven division being blocked near Bridgeport until March 16. Many telegraph poles were blown down, lodging on the track, and one interlocking signal tower was demolished by the wind, killing a man. The Harlem division of the New York Central was nearly as badly off, and a snow plow, pushed by five engines, was derailed in a huge drift near Amenia on March 16, killing five trainmen. A similar derailment occurred on the Lehigh Valley Railroad, by which three men were killed; and fatalities occurred in several other places. Twelve engines were reported derailed or disabled at one time in the yard at New Haven and fourteen at New Brunswick, N. J. Live stock froze to death in large numbers on the Boston & Albany and elsewhere. At St. Johnsville, N. Y., 26 cars of hogs were unloaded and driven into the engine house. Reports about freight trains being covered *out of sight* at Indian Orchard, Mass., on the New York division of the Pennsylvania, and at other places seem to be literally true. Many branch lines had to be neglected, and 75 miles of the Long Island road were reported still blocked on Monday, March 19. Among the trains derailed in the snow was the New York and Philadelphia "two hour train" on the Central of New Jersey, which runs 70 miles an hour for a good portion of its trip.

The stoppage of trains on the elevated roads in New York was primarily due to the density of the traffic; that is, the frequency of the trains and their heaviness as compared with the power of the engines. Although the snow—with some rain to make it sticky—accumulated very fast, the main track could have been kept clear simply by the passage of trains, if storms of this sort were at all common and had been expected. The shortening of the trains, or the addition of pushing engines, would have kept the road open. But with trains following each other so closely, a blockade of a half hour, or even less, at a single point sufficed to stop a score or two of other trains, and then their fate was settled, for several hours at least. At the terminal stations, where there are several parallel tracks and the platforms make the conditions somewhat similar to those in a large yard of a surface road, there was a large accumulation of snow, so that switches became clogged and nothing but an extra force of shovelers and sweepers could cope with the situation.

As a good many railroad men have had new experiences in the line of "snow bucking," and as some of those who are older have had very unfortunate experiences in this storm, we print below the rules of the Northern Pacific for the guidance of its trainmen. It will be seen that running snow plows is not regarded out there as boys' play by any means. It will be understood that these rules are for use with common plows, not the rotary shovel.

INSTRUCTIONS TO BE OBSERVED IN CLEARING THE TRACK OF SNOW AND ICE.

When two or more engines are coupled together, the forward engine will (except in case of danger, when any engine will signal) be considered the signal engine, and the direction the forward engine is going will govern all others in the gang.

When starting for or backing out of a snow drift, the forward engineer *will first place his lever in proper position*, and then signal the other engines. The second engineer will answer the signal first given only when *entirely* ready to give his engine steam. The third engineer will answer the signal of the second engineer only when *entirely ready* to give *his* engine steam, etc. The last signal given will govern *all engineers* in giving steam to their engines, which must be done on the instant.

In case a following or assisting engine is employed, it will keep at least one-half mile in the rear of snow gang, and be prepared to move forward the instant required. Five blasts of the whistles is a signal for following engine to move forward to assist snow gang, and the signal should be *answered* by the same signal.

In case engines become fast in snow bank, it is best to shovel out one of them at a time, and clear the track of snow. The released engine then becomes a helper for the others.

In running for snow banks, engineers must, in absence of express orders as regards speed, use their best judgment, considering the condition of track and bank. When snow is badly packed and frozen, the edge of drift should be broken to allow plow to follow under with safety. In absence of an experienced conductor, head engineer will frequently examine snow banks before running, and especially when snow is deep or badly drifted upon one side of track.

It is useless to run into snow banks with low steam, and engineers will therefore pay particular attention to having full boiler pressure before making a run.

On regular snow-bucking expeditions the pilots of pushing engines must be removed, and engines thoroughly equipped with substantial drawheads, firmly bolted. Also an extra supply of links and pins, and the coal in the tender well covered with tarpaulin.

Snow plows running ahead and on time of passenger trains will pull beyond the station building and await the arrival of the train before proceeding.

Everybody interested must understand that plow engines cannot use headlights, and that the shoe of the plow is liable to crowd torpedoes off the rail without exploding, and the frequent use of the injector in low temperature blinds the engineer by steam, thus requiring the greatest possible care in flagging plow engines.

In blizzards, when it is necessary to follow the plow closely, engineers of following trains will allow as much time as possible between the plow and the following train. All engineers should mark the bad cuts, and in severe storms every precaution should be taken to ascertain if the plow engine is through the cut or has had time to get a flag back. Particular attention is called to this rule.

No man is worth anything in snow plow gang who has not perfect confidence in himself, engine, and plow. Any one who does not feel this is requested to inform his superior.—*Railroad Gazette.*

They Should.

The following unsolicited notice of our several publications we came accidentally across the other day, in looking through the pages of our lively Western contemporary, the *Dubuque Trade Journal.*

Not that editorial encomiums on our different publications are an unusual thing, for seldom a day passes without several publications reaching this office, containing very complimentary sayings, but our Iowa contemporary expresses so much in so few words, and says it so well, we claim the indulgence of our readers for occupying their space in reproducing our contemporary's statement.

"Everybody knows the SCIENTIFIC AMERICAN. It abounds in attractive illustrations and is always filled with entertaining and instructive matter in science and art, especially in the departments of mechanics, invention, engineering, and general industrial progress. The experience and improvement of over forty years of growth have placed it in the forefront of excellence in its line. To thousands of readers it brings a weekly budget of all that is new and interesting in the realm of evolving thought, contrivance, and utility. The SUPPLEMENT also published is an outgrowth of the enterprise demanded by necessary incursions in fields profound, erudite and expanding, where truths sojourn more reconditely and are to be found only by the aid of a higher analysis and the potent grasp of a more complicated deductive logic.

"As said above, everybody knows the SCIENTIFIC AMERICAN, yet everybody does not take it. Nevertheless, they should. The three publications issued by Messrs. Munn & Co., New York, are the SCIENTIFIC AMERICAN, the SCIENTIFIC AMERICAN SUPPLEMENT, and the SCIENTIFIC AMERICAN ARCHITECTS AND BUILDERS EDITION, prices a year, respectively, $3.00, $5.00, and $2.50. They also conduct a large and reliable patent office business and furnish a handbook for inventors."

Engineer Slingerland's Reports on the Assembly Chamber Ceiling, Albany, N. Y.

In our description of the work on the defective ceiling in the State Capitol at Albany, N. Y., in the SCIENTIFIC AMERICAN of March 10, we inadvertently omitted mention of the fact that Mr. W. H. Slingerland, C.E., had made three several examinations and reports on the work. As long ago as 1882 Mr. Slingerland warned the Legislature of the dangerous condition of the Assembly chamber ceiling, and in his third report on the subject, last year, he recommended its removal and that it be replaced by a wooden ceiling. All the examinations since made have fully confirmed the correctness of the original observations and reports of Mr. Slingerland.

Professor Baird's Generosity.

A commendable characteristic of the late Spencer F. Baird, Secretary of the Smithsonian Institution, was his generosity shown toward the young men under him in the Institution. He was carefully scrupulous that his assistants should receive their full share of the honor due them as co-workers with him. In this particular, he was not in the least like Sir Humphry Davy, who was so jealous of his assistant Faraday that the fact became part of the latter's biography.

Major Powell, in a recent issue of *Science*, bears witness to Professor Baird's generosity toward his young assistants, and adds that, when on the track of valuable information, with the end to be gained almost in sight, he was known to turn over the examination to some young assistant, that he might have the credit of completing the work.

Reduce the Postage.

The New York *Journal of Commerce* and a great many other influential newspapers, we are glad to see, are advocating the proposed measure for reducing letter postage to one cent. They justly take the ground that, with the large surplus in our treasury, the post office business of the country need not be made self-supporting. There are other branches of the government in which the people at large are not directly benefited, which do not earn anything for their support. They live on the money collected through the treasury and interior departments, of which the inventors of the country pay an unjust proportion. A great deal might be said in favor of free postage, as an educational factor, but what the public will be satisfied with for the present is a reduction of letter postage to one cent, which measure Congress should not stop to discuss, but put in train for early passage.

Trade Marks Prosecutions.

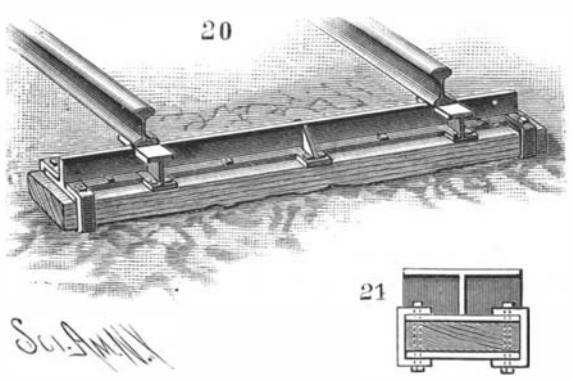
A very interesting trade mark case has just been considered judicially at Sheffield, England. A local firm of cutlery manufacturers were summoned by another firm for using "A 1," which they contended was their trade mark. For the defense it was urged that "A 1" was merely a description of quality, and ought not to be registered as a trade mark any more than "First rate," "High class," or "Superior." The fact remained, however, that "A 1" had been registered. The firm who were summoned pleaded that when they struck "A 1," they never for a moment imagined it was a trade mark, until one day they read of it in a trade organ. They then immediately ceased striking it, ground the mark out of their blades, and destroyed the tool. A single specimen found on their premises must, they say, have been overlooked, for the police in their search failed to find any others, or to elicit any information which would indicate that they intended to strike the forbidden "A 1." The Sheffield stipendiary, exercising his common sense, accepted the explanation and dismissed the summons. It certainly would be intolerable, remarks our informant, if the merchandise marks act, which was passed to prevent fraud, were to be used as an engine of oppression against honorable firms who were in ignorance of the existence of the trade mark they were charged with using.

Prizes Offered for Hospital Furnishing.

The present ex-Empress of Germany last year placed at the disposition of the Red Cross Society the sum of $1,500, and three gold and nine silver medals, to be awarded for the most meritorious efforts in bringing forward something beneficial in the care of the sick and wounded. The society has determined to award these gifts in the form of prizes for the best interior furnishing for a movable hospital, indicating the articles most appropriate, and the best way of obtaining and putting them into use for the fitting up of a portable hospital barrack designed for a given number of sick and wounded patients. The articles designed for competitive prizes must be sent before August 15 to the executive committee of the General International Exhibition, Brussels, Belgium. Requests for further information may be addressed to J. B. Hubbell, Washington, D. C., or Judge Joseph Sheldon, New Haven, Conn.

The Secretion from Roots.

Recent investigations on this subject undertaken by Dr. Hans Molisch have shown that the acid secretion from the roots of plants attacks organic even more powerfully than inorganic substances, not merely dissolving them, but causing in them important chemical changes. It exercises both a reducing and an oxidizing

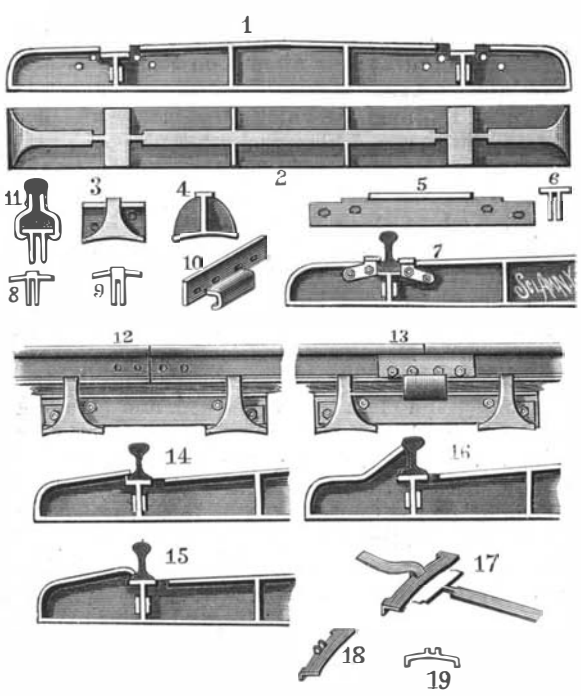


HAWLEY'S RAILROAD TIE, PART WOOD.

power. It stains guaiacum blue. It oxidizes tannin and humin substances, and hence greatly promotes the decomposition of humus in the soil. It transforms cane sugar into reducing sugar, and has a slight diastatic action. Plates of ivory are corroded by it. The root behaves in many respects like a fungus, especially in the fact that the fungus alters the organic constituents of the soil by definite excretions, and causes their more rapid decomposition. This root secretion does not merely impregnate the epidermis, as has been generally supposed, but is often excreted over its surface in the form of drops.

HAWLEY'S IMPROVED RAILWAY TIE.

A railway tie which can be quickly and securely placed in position, and with which the rail will be continuously supported throughout the length of the track, has been patented by Mr. Charles P. Hawley, of No. 510 West 153d Street, New York City, and is illustrated herewith. Figs. 1 and 2 show a side elevation and plan view of the tie, which has an inverted T-shaped body with horizontally flanged top, as shown in section in Fig. 4, the flange being recessed to receive the rails, and following the rounded ends of the vertical web of the tie to form a stay for its ends, as shown in Fig. 3. The ties are connected by a bridge, as shown in Figs. 12 and 13, consisting of two parallel and spaced plates having stepped ends, Figs. 5 and 6



HAWLEY'S METALLIC RAILROAD TIE.

showing side and end views of the bridge. In the recess of the tie in which the rail is supported is a transverse plate, on which rest wood beams, upon which the rails are laid and held by a spring clamp, as shown in Fig. 7, Figs. 8 and 9 being end views of the rail clamps, and Figs. 10 and 11 showing the fish plate and its method of attachment. Figs. 14, 15, and 16 are side elevations of the tie, illustrating modified forms of securing the rail, Figs. 17, 18, and 19 showing the spring plate employed in connection therewith.

As a modification or improvement of this tie, a construction is provided partly of metal and partly wood, so designed that when the wood becomes decayed the tie can be easily taken up and new wood substituted. By this invention a metallic tie is adapted to rest upon a wooden block or plank, and be bolted thereto, as shown in Fig. 20, Fig. 21 showing a form of clamping plates preferably used in connection with the ends of the tie.

In order that the tie may be easily withdrawn from under the track and replaced without disturbing the movement of the rolling stock, a supporting plate or bar, shown in Figs. 22 and 23, is adapted for use with the tie, Fig. 24 showing one of these rail-supporting plates in position, and Fig. 25 illustrating a track supported upon the improved tie, with one tie in position for withdrawal. These ties offer a perfect form for strength and lightness, and to be held securely by the ballast.

The Study of Science.

Nothing could well be more forcible than Sir James Paget's exposition of the advantages of the study of science, and his vindication of even "a little knowledge," so that it be real and true as far as it goes, and has been made the property of the mind by a process of self-verification. Sir James Paget claimed for the study of science that it included the teaching of the power of observation, the teaching of accuracy, and, lastly, the teaching of the methods by which we can pass from that which was proved to the thinking of that which is probable. The rarity of the faculty of sound and deep observation, and the difficulty of accuracy, were well stated. It is indeed one of the defects of our common systems of education that so little attention is given to the cultivation of a faculty of estimating evidence, such as is the chief and great advantage of the study and practice of law.

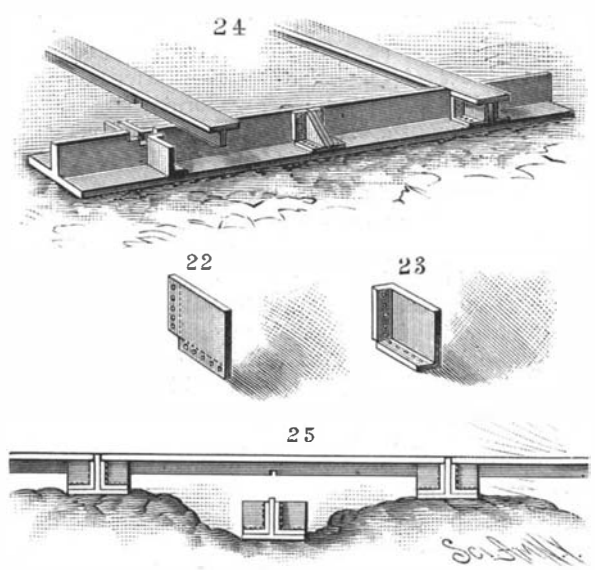
Another quality in which scientific men are apt to be deficient, according to Sir James, is that of enterprise. The love of truth is a fine thing for the sake of truth itself, but the enterprise that seizes truth for the sake of its uses, that takes hold of it at its practical point and applies it to great human and public purposes, is a great faculty, and was fitly praised at the Mansion House—that center of the enterprise of the world. Sir James evidently thinks that if the contagion of science could take effect on a few more of our City men as it has on Sir John Lubbock, great results would follow.

Scientific men want the enterprise of business men, and, according to Sir James, business men would lose nothing of their efficiency for an admixture of the scientific element. A little more push or enterprise on the part of Sir Humphry Davy and Mr. Faraday might have anticipated by a generation the discovery of anæsthetics, or on the part of Dr. Cummings, a professor of Cambridge, the discovery of the telegraph. It seems a trite occupation to go on observing and observing. But, trite as it is, it must be persevered in, and men of authority must speak it out plainly, though few can hope to catch that *felicitas verborum* which is such a gift in Sir James Paget, and of which the following sentence is an illustration: "We all of us know a considerable number of persons who would not for their lives tell a lie, but who, nevertheless, always seemed as if for their lives they could not tell the exact truth."

Loose observation of what is before us, and loose statement of what we think we observe, are the clogs of science. Better be like John Hunter, slow in articulation and embarrassed in public speech, than be superficial in observation and fluent in tongue. Our profession, perhaps, misuses the gift of speech and rhetoric less than all others. In some departments words seem to have taken the place of deeds. But in our calling, too, there is room for more care in observing and narrating facts. Let nobody begin this great discipline lightly. It cost John Hunter much. He slept less and worked more than any other man of his time. And this is the price of getting at facts. At least, this is what he had to pay who, according to Sir James, was "the master of all the science in his own profession—the greatest observer, the greatest thinker, on the whole, we have ever had." The extension of university teaching will be a blessing if it can spread the desire to imitate such men as Hunter and Darwin. It will, indeed, add to the happiness and usefulness of life.—*Lancet.*

Remarkable Discharge of Atmospheric Electricity.

A correspondent of the *Electrician* writes as follows: "A most violent discharge of electricity was observed on board the Danish steamer Constantin, coming from Newcastle and bound for Copenhagen, on Friday morning, February 10, when about 160 miles distant from the English coast. Although the thermometer was at freezing point, thunder and lightning began some way off, between 4 and 5 o'clock A. M. At about 6 a tremendous report was heard, sounding like thunder, and the captain describes the appearance of the vessel as if it were shrouded in a mass of bright red flames, which lit up the surrounding waves. The phenomena was all the more surprising as the thunder and lightning appeared to be at some considerable distance from the steamer, and it could not be compared to an ordinary thunder clap and lightning flash, being far too violent and no regular flash of lightning being seen. The shock was so great that several men in various parts of the ship were knocked down, and the first engineer was under the impression that a boiler explosion had taken place. The whole thing only lasted a moment, but it was attended by a violent wind, and St. Elmo's lights were seen on the tops of the masts and elsewhere. On arriving at Copenhagen, the captain



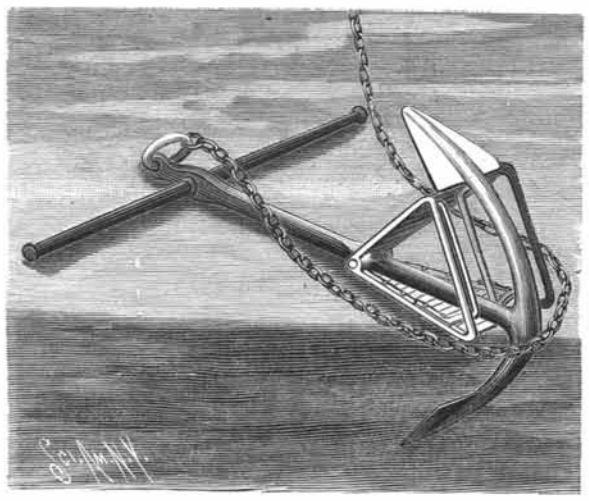
HAWLEY'S RAILROAD TIE—SUPPORTING RAIL FOR WITHDRAWAL OF TIE.

found his suspicions confirmed of alterations having taken place in the deviation of the ship's compasses. The alterations were greatest on S.S.E. and N.N.W. courses, where the deviation, from having been 7 degrees westerly, had become 5 degrees easterly. The vessel was, when the electrical discharge took place, steering E. to N."

THE export of breadstuffs from the United States in 1887 amounted in value, says the *Mechanical News*, to $158,301,708, against $148,123,020 in 1886.

A SAFETY ATTACHMENT FOR ANCHORS.

A device capable of ready attachment to an ordinary anchor, whereby when the anchor is fixed in the bottom it cannot be detached by entanglement with the cable, while the anchor may be catheaded in the usual manner without inconvenience, has been patented by Capt. Nelson Smith, and is illustrated herewith. The invention consists in pivoting a triangular frame to the shank of the anchor between the flukes, the frame being so made that it will guide the cable clear of the non-embedded fluke without regard to the position of the ship, the bars forming the base of the frame having a rounding surface, and extending at such distance downward as to be under all conditions below the plane of the under side of the flukes. The inventor has had this attachment in practical use for a year, and it is found to work satisfactorily. For further particulars

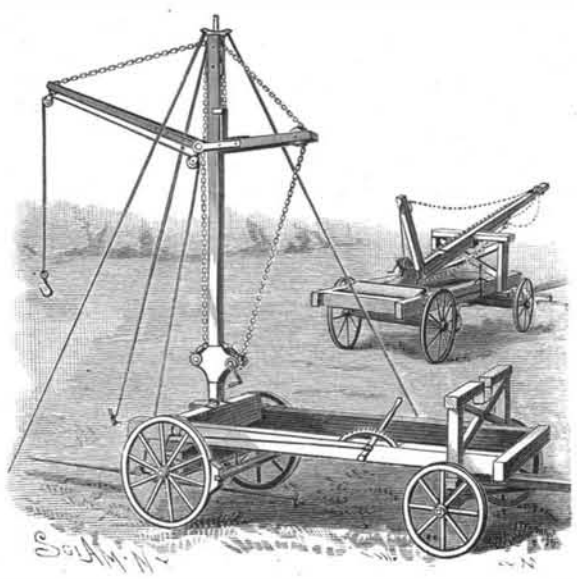


SMITH'S SAFETY ATTACHMENT FOR ANCHORS.

with reference to this invention address Capt. Nelson Smith, care of Mr. L. Heine, Bellmore, Queens County, N. Y.

AN IMPROVED STACKER.

A simple and effective apparatus for stacking hay or grain in the field, and one easily moved about and set up in place, has been patented by M. A. Heinlen, of San Jose, Cal., and is illustrated herewith, being shown as set up for use and in a closed or folded position. A suitably constructed derrick is provided in connection with a truck, and to erect the derrick, guy ropes, attached to a plate on top of the derrick post, are fastened to stakes driven in the ground, and the truck is moved slightly forward. The derrick frame is raised or lowered as desired by a windlass, the derrick arm being also moved into a horizontal or inclined position by another windlass, both of which are mounted near the lower end of the derrick post. The fork rope passes over pulleys on the derrick arm and post, and thence over a pulley hung on a link supported by arms secured to



HEINLEN'S STACKER.

the truck frame, and by a link adapted to be secured to stakes driven into the ground under the truck. The team used for pulling the machine is then attached to the lower end of the fork rope, a fork of any approved construction being secured to the outer end of the rope, when the fork and rope are manipulated in the usual manner.

Failure of Built-up Guns.

No less than ten of the large 9·2 guns made for the British government have recently failed at test, the inner tubes of nine having been split and the outer casing of the other fractured. This, we believe, is the style of gun that has of late been so urgently advocated by certain of our army and naval officers as necessary for adoption in this country, to the exclusion of all other kinds of ordnance. In the opinion of these wise men, all people who hinted at anything else were behind the age.

Bronze Tests.

There have been completed at the Watertown Arsenal some interesting tests of alloys, which the government had ordered, with a view to getting the best possible material for the screws for the fifteen or twenty new war ships now building. The results are as follows:

ALUMINUM BRONZE AND BRASS.

Bronze Composition.	Pounds Elastic Limit.	Per Cent Elongation.	Pounds Tensile Strength Per Square inch.
Copper and 8 per cent Al and Si.....	19,000	23·7	58,500
Copper and 10 per cent Al and Si.....	33,000	3·2	68,000
Copper and 8½ per cent Al and Si.....	18,000	26·0	61,000
Copper and 7½ per cent Al and Si.....	19,000	9·3	52,000
Copper and 7 per cent Al and Si.....	17,000	11·9	46,000
Copper and 8¾ per cent Al and Si.....	24,000	13·3	66,500
Copper and 9 per cent Al and Si.....	28,000	4·5	66,000
Copper and 10¼ per cent Al and Si.....	33,000	3·6	72,500
Brass Composition.			
Copper and 3⅛ Al, 33⅛ per cent Zn.....	55,000	1·6	70,000
Copper and 3⅛ Al, 33⅛ per cent Zn.....	65,000	2·5	82,500

GOVERNMENT GUN BRONZE.

	Elastic Limit.	Per Cent Elongation.	Pounds Tensile Strength Per Square Inch.
Copper 88, tin 10, zinc 2, per cent.....	9,000	1·5	18,000
Copper 88, tin 10, zinc 2, per cent.....	10,000	2·0	18,000
Copper 88, tin 10, zinc 2, per cent.....	13,000	3·0	20,000
Copper 88, tin 10, zinc 2, per cent.....	11,000	5·0	22,500
Copper 88, tin 10, zinc 2, per cent.....	13,000	1·5	23.000
Copper 88, tin 10, zinc 2, per cent.....	10,000	3·5	19,000

All bars were 22 inches in length by 1⅛ inches in diameter, and 10 inches or 15 inches between elongation marks. The government gun bronze was made at the navy yard, and is the material that has been used universally in both the army and navy departments in the construction of all bronze cannon, propeller wheels, gun carriages, etc., for the past fifty years. The above tests were made at the Watertown U. S. Arsenal, Watertown, Mass., under the auspices of the United States Navy Department, during the week ending December 13, 1887.—*Jour. Franklin Institute.*

Secrets of the Brandy Industry.

In a recent report from Mr. Vice-Consul Warburton, some suggestive statements are made as to the condition of the brandy industry in the department of the Charente-Inferieure, from which, before the vine failure, a considerable portion of the brandy exported to this country (England) was derived, although much also came through Cognac, which is the headquarters of the trade. Mr. Warburton states that in 1875 the department produced 200,000,000 gallons of wine, a great part of the surplus over the local consumption being converted into brandy. In consequence, however, of the ravages of the phylloxera the produce has gradually fallen off, until in 1886 it was reduced to 13,000,000 gallons. As the local consumption of wine in the department is estimated at 12,000,000 gals., it will be seen there must have been comparatively little left for brandy making. In fact, Mr. Warburton says that pure brandy has become very scarce and difficult to get in the department, most of what is sold being mixed with beet root or cheap German spirit, while the latter is very often sold as cognac without any mixture at all. Mr. Warburton significantly adds that the supply of "cognac" is very limited and must diminish every year, so that if the trade in the reputed article continues to go on much the same as it did before the failure of the vines, it will be evident that fraud is on the increase.—*Pharmaceut. Journal.*

AN IMPROVED LAWN MOWER.

A lawn mower made with a finger bar and a cutter bar reciprocating in the guard fingers of the finger bar, similar to an ordinary mowing machine, has been patented by Mr. John F. Watermolen, of Green Bay, Wis. The main frame of the machine has front side pieces carrying a finger bar in front of the drive wheels, and bolted to a plate on one of the side pieces is a casing or housing inclosing gearing and a shaft for transmitting motion from a sleeve projecting from a clutch block on the axle to a shaft which reciprocates the cutter bar. This clutch block has a spring-actuated dog to engage with notches of the drive wheel for locking the wheel to the clutch block on the forward movement of the machine, and disconnecting it on its backward movement, and the clutch blocks near each wheel on the axle are connected together by an intermediate clutch tube, so that the power of both drive wheels, when the machine is moved forward, will be exerted to give a reciprocating motion to the cutter bar. The connections of the side frames of the machine are such that they cannot be rocked upon the axle without lifting or lowering the cutter bar.

AN IMPROVED STEP LADDER.

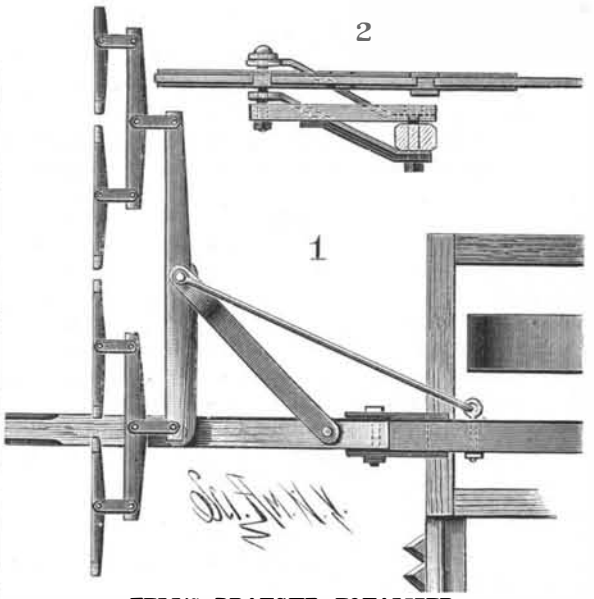
A step ladder in which the two hinged main limbs are made capable of simultaneous expansion and contraction has been patented by Mr. Alfred M. Whiteley, of Atlanta, Ga., and is illustrated herewith. Both the

WHITELEY'S STEP LADDER

step portion and the leg portion, instead of resting at their lower ends upon the ground, are fitted to be capable of sliding up and down within outer separate frame portions, thus providing for the bodily extension of the ladder at its front and back, the step section having a sliding rod and eye connection with one independent supporting frame, while the leg section has a sliding strap-like brace connection with another independent supporting frame. This construction gives great facility of raising or lowering the ladder, and of locking or holding it at different heights.

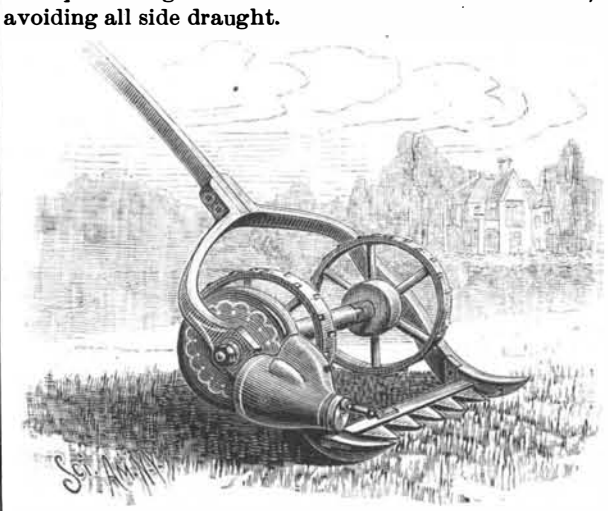
AN IMPROVED DRAUGHT EQUALIZER.

A draught equalizer, more especially adapted for mowers and reapers requiring four draught animals, and so arranged that one animal is on the inside of the



FELL'S DRAUGHT EQUALIZER.

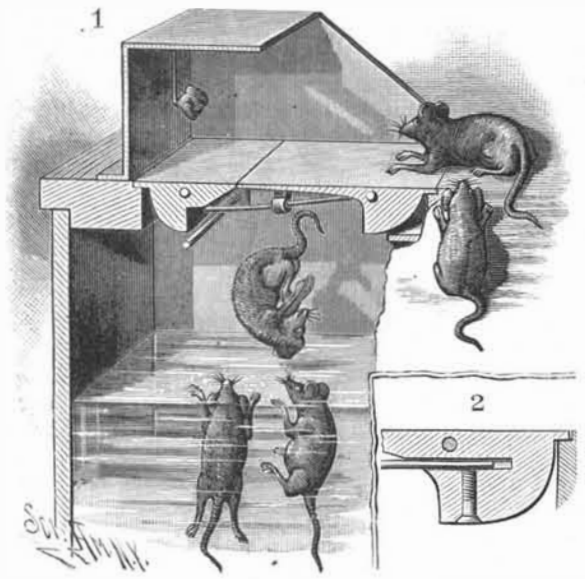
pole while three are on the outside, is illustrated herewith, and has been patented by Mr. Michael Fell, of Everly, Iowa. A bracket is attached by a bolt to the pole, and extends at right angles thereto, a brace being secured by one end to the under side of the bracket, and held at the other end on the bolt, as shown in the sectional view, Fig. 2. From the outer end of the bracket a brace extends rearwardly, and is secured to a bolt held on the pole, while a rod held by one end on the outer end of the bracket is pivoted or swiveled at its other end on a bolt secured to the draught beam, or to any other suitable part of the machine. This arrangement permits of an upward swinging motion of the pole with the equalizing attachment, and assures the equal draught of the four animals on the machine, avoiding all side draught.



WATERMOLEN'S LAWN MOWER.

AN IMPROVED TRAP.

A trap designed to catch an animal and drop it out of sight, and which will automatically reset itself for the next animal, is illustrated herewith, and has been patented by Mr. John T. Moxley, of Owosso, Shiawassee County, Mich. It consists of a bottom board or



MOXLEY'S ANIMAL TRAP.

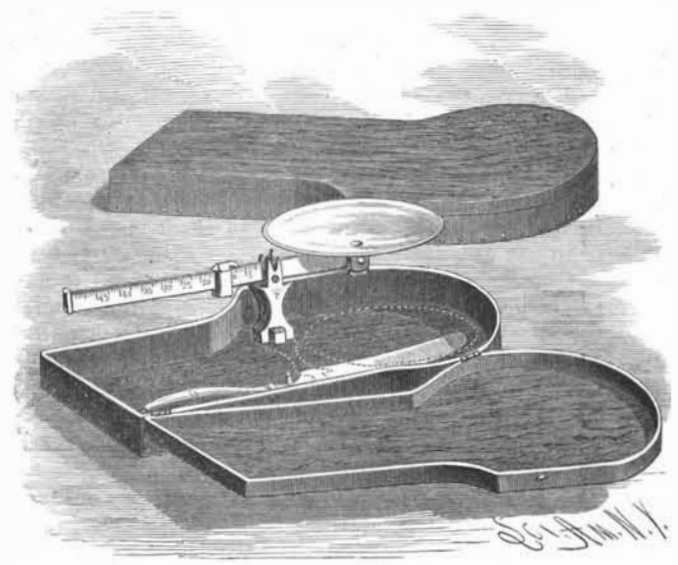
floor, preferably placed on top of a vessel holding water, a tip board and trip block being pivoted in an opening in the floor. The tip board is made longer than the trip block, and the outer ends of both the board and block are counterweighted. The detent consists of a latch fitted in a horizontally ranging socket in the tip board, and held by a screw, as shown in Fig. 2, its outer end being held by a bearing on the under side of the board to fit into a notch in the side of the trip block catch, the arrangement being such that the tip board will remain firm until the animal touches the trip block, when, be the touch ever so light, both the block and board will turn on their pivots, and the animal must fall through into the water. The gravity of the heavy ends of the tip board and trip block causes them to immediately reset themselves to normal latched positions, ready for the next animal.

Fractional Currency.

The House of Representatives has passed a bill to authorize the issue of fractional paper currency in denominations of 10, 15, and 25 cents, when demanded from the Secretary of the Treasury. This will be welcomed by the public as a great convenience in the transmission of small sums of money by mail. It is found in practice that the postal note system now in vogue is inconvenient, as compared with fractional currency. The postal notes can only be obtained and paid at money order offices, which only number 14 per cent of all the post offices. It would add to the convenience if denominations of 5 and 50 cent pieces were printed.

AN IMPROVED POCKET WEIGHING SCALE.

A scale in which the parts are so constructed that the beam and pan may be folded down to rest within a case of such size that it may easily be carried in the pocket, is illustrated herewith, and has been patented by Mr. William R. Watt, of Somerville, Tenn. To the bottom of the case is secured a post, with which is



WATT'S POCKET WEIGHING SCALE.

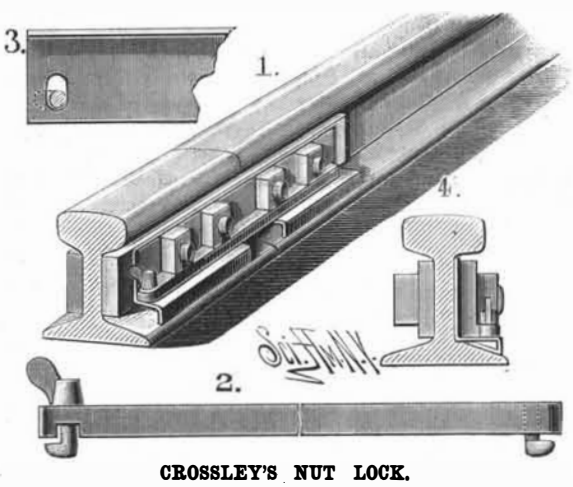
connected the scale standard, by means of a pin, the lower end of the standard being slotted. The upper end of the standard is also slotted to receive the scale beam, mounted on a pivot pin, one end of the scale beam carrying a block to which the pan is secured. The pan is held in horizontal position when in use, by a spring on the under side of the beam, bearing against the block; but when the scale is to be folded within its case, a quarter turn given to the pan withdraws a catch, and allows the pan to be folded down. A spatula is held against the rear side of the case by a post or pin, affording a handy implement for manipulating medicines, etc.

Patent Medicines.

The *Medical Record* extracts from an address of Professor Chandler, in which he says: "These firms of manufacturers of proprietary medicines, nine out of ten, live solely by the newspapers, and sometimes are admirably managed. I know some establishments in which there is a regular staff employed. I know something about them, because they try to bribe me to certify to the value of their concoctions. As I say, there is a regular staff. There is the literary man, who writes the letters, giving marvelous accounts of marvelous cures. There is the artist, who shows the patient before and after taking twenty-two bottles of the medicine; there is the poet, who composes poems upon the subject; there is the liar, who swears to what he knows isn't true, and the forger, who produces testimonials from his own imagination. Without exaggeration, I should say that nine out of ten of these proprietary medicines are frauds, pure and simple. The real business is advertising for dupes. The medical part of it is but a side issue. I am pretty sure, if I were to pound up brickbats, and spend a hundred thousand dollars in offering it at a dollar an ounce, as a sure cure for some disease which cannot be cured, I should get back at least a hundred and ten thousand dollars, thus giving me ten thousand dollars for my trouble. Nine-tenths of the medicines sent out in this fashion have no more curative properties than brickbat dust."

AN IMPROVED NUT LOCK.

A nut lock especially designed for railroad use, and which may be readily applied in connection with the ordinary fish plates, is illustrated herewith, and has been patented by Mr. John B. Crossley, of Clay Center, Kan. It consists of an angle plate of thin metal, about equal to the length of a fish plate, its height nearly corresponding to the distance between the upper face



CROSSLEY'S NUT LOCK.

of the rail base and the under surface of the tread, Fig. 3 showing its form and Fig. 2 being a side view of the tie bar. The device is simple and cheap in construction, and can be readily applied or removed. For further particulars, address Mr. Chas. Crossley, Clay Center, Kan.

Three Sixes.

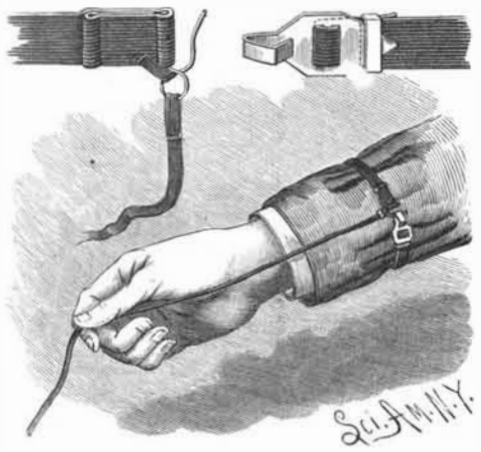
Speaking of fires in this city, one occasionally hears the remark that the alarm sounded "three sixes." Now, what is meant by "three sixes" is an enigma to most persons. It is popularly supposed it is a general alarm, and will bring to the scene of action all the fire apparatus in the city. This is a mistake. The "three sixes" are substantially equivalent to a double third alarm. *Fire and Water*, a journal devoted to the firemen's interests, explains that ordinarily a third alarm calls out an average of eleven engine companies and four hook and ladder companies. The "three sixes" sent out after a third alarm has been sent in will bring out, ordinarily, twenty-two engines, eight hook and ladder companies, two water towers, the chief, two assistant chiefs, and several chiefs of battalions. These numbers might vary a little, according to the location of the fire.

The full force of the New York City department consists of fifty-five engine companies, eighteen hook and ladder companies, two water towers, two fire boats, one chief of department, two assistant chiefs, and twelve chiefs of battalions.

AN approximate idea of the amount of manganese contained in steel can be ascertained by means of the magnet. A magnet capable of lifting 30 pounds of ordinary steel or iron will only lift a few milligrammes if the metal contains 20 per cent of manganese. So small a quantity as 8 per cent of manganese will nearly neutralize the magnetic attraction.

AN IMPROVED SLEEVE STAY.

A device for holding the sleeve in place on the arm when another sleeve is being drawn over it is illustrated herewith, and has been patented by Mrs. Abby M. Terry, of No. 269 Vernon Avenue, Brooklyn, N. Y. It consists of a sleeve strap, one end of which is folded or fastened over a U-shaped hook, adapted to engage an eye or loop on the other end of the strap, there being a hand string for drawing the hook from the eye, after the sleeve is in place, whereby the strap is completely



TERRY'S SLEEVE STAY.

loosened, and may be entirely withdrawn from the sleeve.

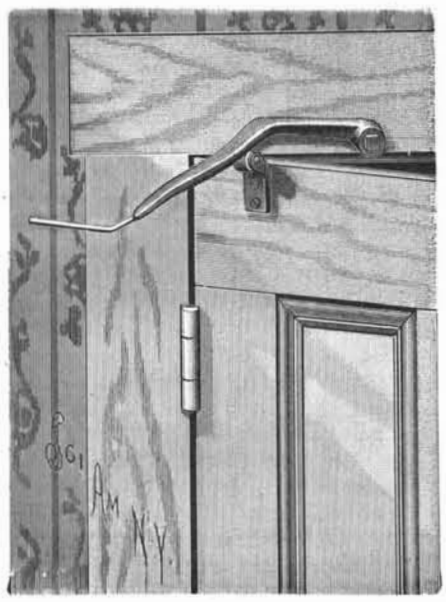
Train Telegraphy.

The practical value of the new system of telegraphy, by which messages can be sent from moving trains, was well illustrated by its workings on the Lehigh Valley Railroad during the recent great snow storm. In the accident near Three Bridges the induction train telegraph operator was on board, and at once telegraphed back to Flemington for a wrecking train. Within a short time Superintendent Donnelly arrived, and during the entire day messages were sent to and from the wrecking train, and surgical relief was obtained. All the beleaguered passenger trains, every one of which was equipped with the new system, were located by means of train telegraphy, and provisions were sent to the hungry passengers. Belated passengers sent dispatches to anxious wives from the various stalled trains, and all the manifold business of railroading was carried on with celerity. More than 200 messages were sent back and forth over the single line of the company during the three days of delay.

The poles used to carry the line are only sixteen feet high, and they expose little surface to the storm. The messages are transmitted by induction from the metal roof of the car to the line, a distance of ten feet, and even when cars and line were both buried in the drifts no inconvenience was suffered, as the dry snow acted as a good insulator.

AN IMPROVED DOOR CLOSER.

A door closer of cheap and simple construction, not liable to breakage or to get out of order, has been patented by Mr. George W. Rodecap, of Middletown, Ind., and is illustrated herewith. It consists of a metal cam lever fulcrumed to the casing, in connection with



RODECAP'S DOOR CLOSER.

a plate piece fastened to the door, in which is journaled a roller. The lever may be weighted, to close the door automatically; but its form is such as to give a powerful leverage, which is exerted more strongly when the door is nearly closed. The device is more particularly adapted for use on doors having the face flush with the casing, and on heavy doors or gates a spiral spring may be used in connection with the lever, to increase its power.

THE REED & CARNRICK FOOD LABORATORY.

Our first page illustration represents a portion of Messrs. Reed & Carnrick's laboratory, apparatus, and machinery devoted to the manufacturing of Carnrick's Food for Infants, and Beef Peptonoids, located two miles south of Goshen, Orange Co., N. Y., in the middle of the best milk district in the United States. The laboratory in which their other products are manufactured is at Yonkers, N. Y.

Carnrick's Food is composed of 45 per cent of powdered milk, 45 per cent of dextrine, and 10 per cent additional milk sugar. As soon as the milk is received, it is drawn into digesting tanks and brought to a temperature of 115 to 120 deg. Fahr. A freshly made extract of the pancreas of the pig is then added, the milk being kept at the above temperature for sixteen minutes. Repeated experiments have shown that the digestion of the milk with an extract of pancreas of sufficient strength for sixteen minutes will render the casein of cow's milk partially a peptone and leave the remaining undigested portion light and flocculent like the casein of human milk. When the manufacture of this food was commenced, comparisons were carefully made with average samples of human milk. The extract of pancreas is made for each batch from perfectly fresh sweetbreads.

The partially digested milk is then raised to 200 degrees Fah., to entirely destroy any further activity of the digestive ferment, after which it is drawn into the vacuum pan, and evaporated nearly to the consistency of ordinary condensed milk. At this stage it is drawn from the ordinary condensed milk vacuum pan to a special vacuum pan, which contains revolving and mixing machinery, where the milk is combined with the 45 per cent of dextrine and 10 per cent of milk sugar, forming a homogeneous mass, the evaporation being continued till the water is practically removed. The product is then powdered and bolted as finely as ordinary flour.

The dextrine is prepared by taking wheat flour and baking it into crackers, which requires the mixing of the flour with water, so that the starch granules will swell and be in a better condition for further conversion into dextrine. The crackers are then powdered and placed in a dextrine apparatus for six hours, subject to a heat of 400 degrees Fah., which completes the conversion of the starch into soluble starch and dextrine.

Messrs. Reed & Carnrick commenced business twenty-four years ago, and their preparations are used extensively by the medical profession in every civilized country on the globe. About three years since, they commenced the manufacture of Carnrick's Food for Infants. This preparation is entirely different from the various foods in the market in use for infants deprived of the breast milk, approaching so near human milk in composition and digestibility that the demand has been unprecedented, and the manufacturers have been compelled to produce machinery that will turn out about ten times the quantity that was sold a year ago. They therefore concluded to erect their plant in the center of the most important milk district in the country, so that the milk would be absolutely pure and free from all possibility of contamination. The cause of the great mortality of infants in large cities, especially in the summer season, is unquestionably due, in a large measure, to feeding infants condensed milk composed of nearly one-half cane sugar and impure milk brought in from the country. There is a great deal of milk sold in large cities in hot weather that has undergone deleterious changes, and some of the infant foods in the market are composed of simply roasted flour and malt sugar. These must be added to cow's milk, or the child would starve. There are several preparations called milk foods which contain so little milk in proportion to the roasted flour or malt sugar that they also must necessarily be added to cow's milk. Carnrick's food for infants perfectly nourishes the child without the addition of cow's milk, and their mode of treating the milk is of such a character that it is digested as easily by the child as human milk.

The ingredients of milk are nitrogenous or flesh-forming matter, fatty or heat-giving and respiratory food, sugar, mineral matter or ash, and water. The butter and sugar of milk produce fat, being styled by physiologists heat producers. The casein or cheesy portion resembles the gluten of wheat in composition, and belongs to the class of food substances termed flesh formers. The ash or mineral part of the milk is chiefly employed in forming the bones of the young it is destined to nourish. In point of nitrogen, or flesh-forming food alone, one gallon of milk is equal to one pound of lean meat, and two quarts are equal to one pound of bread, while it takes eight pounds of potatoes to yield the equivalent of four pounds of milk. In estimating the nutritive equivalents, calculated according to the amounts of nitrogen in the dry substances, human milk being at 100, Indian corn stands at 100, wheat 119, beans 320, cow's milk 237, and cheese 331. Cow's milk is composed of about eighty-six parts of water and fourteen parts of solid matter, the latter made up of about 4·1 casein, 3·9 butter or fat, 5·2 sugar or lactin, and 0·8 of mineral substance. At first sight the proportion of water seems large, although this is all driven off in Messrs. Reed & Carnrick's preparations, yet eggs have 74 per cent of water, salmon 77, lean beef and mutton 72, fat beef and mutton 52, and potatoes 75 per cent. As an article of food, therefore, milk is more economical generally than beef, its purely economic value in this respect being generally unappreciated by either the producer or consumer, as it contains all the elements of nutrition within itself, and in the most digestible form. The breed of cattle, nature of their food, and care and cleanliness in the handling of the product, are all important factors in determining the value of the milk; but the facilities of the firm for obtaining milk of the very best quality, from their location at the center of the great dairy district of New York State, in Orange County, are unrivaled.

The agreement made by the firm with those who furnish the milk used is in the form of a regular legal contract, and very strict in its provisions. It provides that the milk shall be pure and unadulterated, and its temperature not to exceed 52° Fahrenheit, when kept at home; that it shall not be produced from glucose, starch feed, brewers' grains, sprouts, slop feed, or any feed named and prohibited by the firm; that the udder and teats of the cow shall be thoroughly washed or brushed before milking, especially in winter, when stabling and stables shall be cleaned twice a day, and the cows are to be bedded with clean straw when stabled; that all milk shall contain an equal amount of fat; that all strainers, pails, and other vessels used in the handling of milk must be thoroughly cleaned immediately after milking, and that representatives of the firm shall have the right and privilege of entering the premises of those selling them milk and examining the manner of handling the milk, and the right to test the same; that all night's milk delivered the following morning must be cooled immediately after milking, in water, remaining therein over night, and not be left in the stable after milking; that the cows must have free access to pure, clean, and fresh water, and under no circumstances be allowed to drink from stagnant pools or go thirsty, while low places in pastures, where water may gather after heavy rains, must be drained or fenced in; that only spring wagons must be used in delivering the milk to the works, to prevent churning, while all cans must be provided with tight fitting covers and over these a canvas cover, such covers to be kept clean; that in summer, before starting for the works, a cloth wet with cold water shall be placed over the cans to keep them cool, as under no circumstances will the firm receive milk warmer than 64°; that in winter, when cows are milked in their stalls, the milk must be immediately removed from the stable, and out of reach of bad odors; and that the stalls and stables must be kept thoroughly clean, provided with good ventilation, and whitewashed at least twice every year. Great care must also be used to guard against freezing, for the firm will not accept milk that has been frozen.

The above contract is enforced strictly in every detail, and the rules governing the care and feeding of the cows and the handling of the milk are based on those laid down by Prof. Vaughan for the production of perfect milk. A competent person is employed, who devotes his time to visiting, at irregular intervals, once or twice a week, those who supply the milk.

Touching the value of "Carnrick's soluble food," Prof. Stockbridge, of the Imperial College of Agriculture, Japan, in forwarding an order for a package, volunteered a specific and most emphatic testimonial. Prof. Stockbridge wrote that his baby boy, when about four weeks old, "showed signs of serious indigestion, passing material which analysis proved to be almost wholly unchanged casein. The most natural course was to attempt to remedy the difficulty by changing the diet of the mother, but, after two weeks of unsuccessful experiment, recourse was had to 'Carnrick's food,' followed by immediate disappearance of all digestive trouble. The analysis of the mother's milk showed that its nutritive ratio (relation of albuminoid to carbohydrate constituents) was too low, the amount of fat and milk sugar present was not sufficient to enable the infant to digest the excess of nitrogenous food furnished. By supplying this deficiency by feeding soluble carbohydrates, the proper nutritive ratio was restored, and the mother's milk, thus supplemented, afterward accomplishing all that could be desired, and all that was gained by the use of the 'Carnrick's food' alone." The Professor adds that "the Carnrick food is as perfect and efficacious in practice as its composition is correct in theory, and appears to be compounded on thoroughly scientific principles, in this respect differing from most of the other articles placed on the market for similar uses."

Dryness of Walls, etc.

The author lays a very thin slip of gelatine against the object. If this is not thoroughly air dry, the gelatine becomes curved, with its convexity toward the object.—*J. Nessler, Chemiker Zeitung.*

Leprosy.

The question of the contagiousness of leprosy has again been raised by the action of the board of health of Philadelphia in fining a physician $100 for not having reported two cases of that disease which were under his care. The editor of the New York *Medical Journal*, in commenting on this subject, claims that there is a mass of incontrovertible evidence to be found in medical literature which ought to place its contagiousness beyond question. In the Sandwich Islands the physicians believe strongly in its communicability, and a number of instances are given which confirm this belief. One of these is that of a Belgian priest who lived in the leper settlement for the purpose of nursing and otherwise caring for those who, having the disease, were here isolated. The result is that the priest himself is now a victim of the disease. The medical attendants of these outcasts will not go near them without having their hands protected by gloves. The editor of the journal quotes the opinions of other writers who agree with him in his views, and refers to the report of the English commission appointed by the Royal College of Physicians in 1867, which holds that leprosy is not contagious. He concludes by saying:

"In the face of all this reliable evidence, a reasonable doubt can scarcely be entertained of the contagiousness of leprosy. In its power of contagion, leprosy may well be, as it often has been, compared to syphilis, and, like that disease, it is frequently contracted through sexual intercourse, and is also just as frequently transmitted to the offspring."

Utilizing the Tin Can.

Probably no one article has been put to such a variety of uses as the tin can. A woman up in Maine has found a new use for them, and she tells, in the *Lewiston Journal*, how those too good to throw away she utilized:

"I learned to use them for brown bread when tenting out at the seashore where dishes were scarce and cans plenty, and I liked them so well that I kept up the practice after coming home, especially after finding out that four of them just laid in my steamer. But this is not all the uses I find for them. In a few weeks my kitchen will be decorated with old salt boxes each filled with as many cans, minus the bottoms, as will stand up in it, each can filled with good garden soil and each of these tin pots holding a tomato, dahlia, or other plant. I find it easier to transplant without disturbing the roots when the plants are so treated, and having no bottoms, the cans do not hold water enough to spoil the roots, as might be the case were they used separately. Sometimes I have sunk in the soil in the garden, near a plant that needed a good deal of water, an old can with a hole or two punched in the bottom to help it to leak, and then filled this can with water each night or morning. I also found this a good chance to add fertilizers by putting them in the water. John likes the cans to put around the trunks of young fruit trees. He says he has saved enough trees from the mice in this way to pay for all the canned tomatoes, corn, and peaches we have eaten. He takes off the bottom, cuts open one side, fits them around the stem, and draws the sides together again, and then pushes them down so that an inch or two is below the top of the soil. The pieces of tins straightened out have also done duty as scarecrows, dustpans, and several other things in an emergency."

What Advertisers Like to Know.

George P. Rowell & Co., the publishers of the American Newspaper Directory, undertake to rate newspaper circulations very much as the mercantile agencies give the capital and credit ratings of the business community. They state that only about one publisher in ten is willing to have his exact issue known, and tells it with truthful precision, but in a card to us they state: "It is a fact that less than one paper in sixteen has furnished such a straight-out statement of actual issues as you have done, for your SCIENTIFIC AMERICAN publications."

In the twentieth annual issue of their book, now in the binder's hands, they plainly designate every paper which is rated in exact accordance with a detailed statement from the publisher.

The Adventures of a Horse.

Among the incidents of the storm in Boston, the *Electric Review* relates how the entanglement of a horse attached to one of L. G. Burnham's coal delivery teams was caused by the wires. It was in the evening. The horse got entangled and the wires threw him down. Some of the snarl of wires proved to be those of electric lights. The kicking and the struggles of the horse brought the wires in contact, and in the words of the teamster, "Every time he kicked it would lighten, and every time it lightened he would kick! I thought to myself, 'He is bewitched with lightning.' I tried to unbutton him, and every time I unbuttoned one place he was struck with lightning in another." The poor horse was finally released from his peril by somebody who understood the cause of the trouble.

SOME EXPERIMENTS WITH AN ELECTRO-MAGNET.

BY GEO. M. HOPKINS.

Many very interesting and instructive experiments may be tried by means of an electro-magnet having a length of five or six inches, and capable of sustaining a hundred pounds or so. The experimenter should make his own magnet. If he is the possessor of tools and a lathe, and understands working iron, let him bend his U-shaped bar, square off its ends, turn two wooden spools suited to the bar, fill them with wire, and proceed with his experiments. But if he is not quite so fortunate, it is possible the hints here given may be of some service. It often happens that a blacksmith is not available, or a bar of the right size is not at hand. To avoid difficulties of this kind, the core of the magnet is made of twenty thicknesses of ordinary one inch hoop iron, about 1-20 inch thick, thus making a rectangular U-shaped core one inch square. The parallel arms of the magnet may be five inches long, and the distance between the arms four inches.

The pieces of hoop iron are readily bent and fitted one over the other in succession, the inner one being

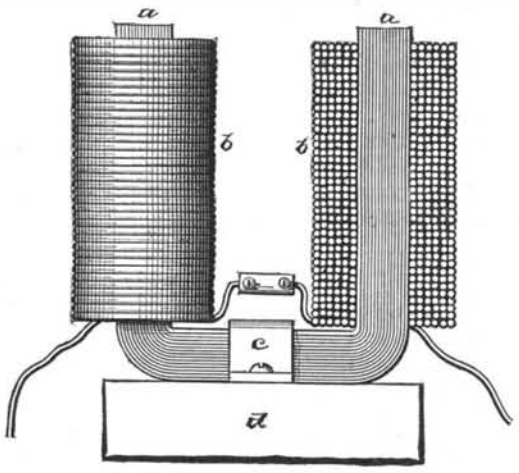


Fig. 1.—ELECTRO-MAGNET PARTLY IN SECTION.

fitted to and supported by a rectangular wooden block. When the core has reached the required thickness, the layers of which it is formed are fastened together by means of iron rivets passing through holes traversing the entire series of iron strips near the ends of the core. If it is inconvenient to secure the layers in this way, they may be wrapped from the extremities down to the angles with very strong carpet thread or shoe thread and afterward coated with shellac varnish, which holds on the thread and assists in cementing the whole together.

The extremities, *a a*, of the core must be filed off squarely, and the yoke is to be clamped to the base, *d*, by the clip, *c*, which may be made of hoop iron or of wood.

To the arms, *a a*, are fitted the coils, *b b*, which are formed by the aid of the device shown in Fig. 2. This device consists of two wedge-shaped wooden bars, A B, which together form a bar a little larger than the core of the magnet, and two mortised heads, C D, fitted to the bar with a space of 4¾ inches between them. The head, D, is provided with a screw for clamping the wedge bars, A B, and with an aperture, *a*, for the inner end of the wire. The heads are lined with thick paper, and the bar between the heads is covered with a single thickness, E, of heavy paper.

The winding is begun by passing the end of the wire (No. 16 copper cotton-covered magnet wire) through the aperture, *a*, allowing it to project about three inches, then winding the wire evenly over the bar from one end toward the other until the head, C, is reached. Before the second layer of wire is wound, the first one is brushed over with thin glue. The second layer is then wound, starting from the head, C, and winding in the same direction toward the head, D, and when the second layer is complete it is brushed over with the glue, after which the third layer is wound and glued, and so on, laying the wire on like thread on a spool until six or eight layers have been applied.

To prevent the destruction of the coil by the loosening of the ends of the wire, a loop of tape should be placed on the beginning of the first convolution and laid over the first layer of wire, so that it may be clamped by the second layer, and in a similar manner some stout threads should be placed between the outer layer and the adjacent layer, so that they may be tied over the last convolution of the last layer. After the glue has become thoroughly dry and hard, the heads, C D, are removed from the bars, A B, and the tapering bars are knocked out of the coil in opposite directions, their wedge shape facilitating this removal. Two coils precisely alike are required. When they are placed on the core, the inner end of one coil is

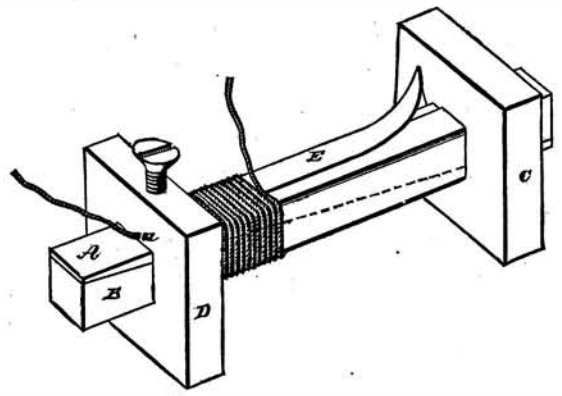


Fig. 2.—FORM FOR COILS.

connected with the outer end of the other, and the remaining ends are connected with a battery.

To give the coils a finished appearance, they may be coated with shellac varnish, colored with a pigment of suitable color, vermilion for example.

Probably the best battery for use in connection with this magnet is one of the plunging bichromate form. The simple plunge battery described on page 116, vol. lvii., SCIENTIFIC AMERICAN, will answer admirably.

To the poles of the magnet should be fitted two short

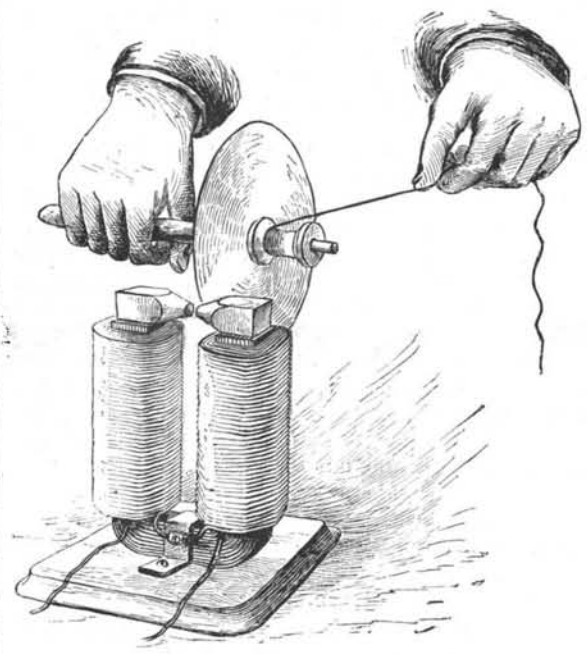


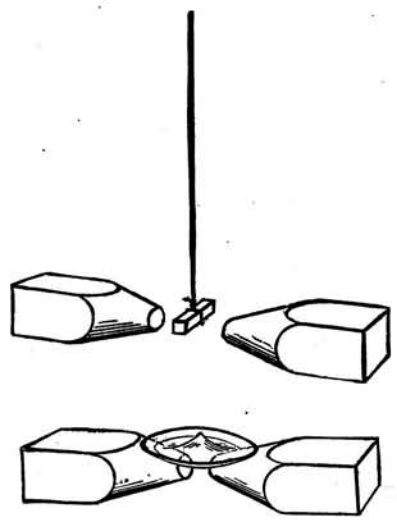
Fig. 3.—FOUCAULT'S EXPERIMENT.

iron bars, having conical ends. These bars will need no special fastening, as the attraction of the magnet will hold them in place.

It is perhaps hardly necessary to enter into the details of many experiments with this magnet, as they are described in the text books. A few well noticed, the reader is referred to electrical and physical works for others.

In Fig. 3 is shown a simple way of reproducing Foucault's experiment. A centrally apertured copper disk, 6 inches in diameter, is attached by means of small nails to the end of a common spool, and the spool is mounted so as to turn on a screw inserted in a handle. The short iron bars are arranged on the poles of the magnet, as shown in the engraving, with the conical ends about one-fourth inch apart. A strong current is sent through the magnet, and the copper disk is whirled rapidly by quickly unwinding a string from the spool, after the manner of top spinning. The edge of the disk is then inserted between the conical pole pieces, but without touching them. The rotation of the disk is almost instantly stopped. A sheet of copper moved back and forth between the pole pieces offers a sensible resistance.

Most experiments in diamagnetism may be performed with this magnet. Short bars of various metals may be suspended, by means of a silk fiber, between the poles. Iron, nickel, cobalt, manganese, etc., will arrange themselves in line with the poles, while bismuth, antimony, and several other metals will arrange themselves across the line of the poles. The former are known as paramagnetic bodies, the latter as diamagnetic.



Figs. 4 and 5.—DIAMAGNETISM.

Liquids placed in a watch glass, as shown in Fig. 5, exhibit paramagnetic or diamagnetic properties; by piling up at the center of the glass, as shown in the engraving, if paramagnetic, or by piling up on opposite sides of the center, if diamagnetic.

The coils of this magnet being removable may be used in magnetizing steel bars, and for other purposes requiring the coils only.

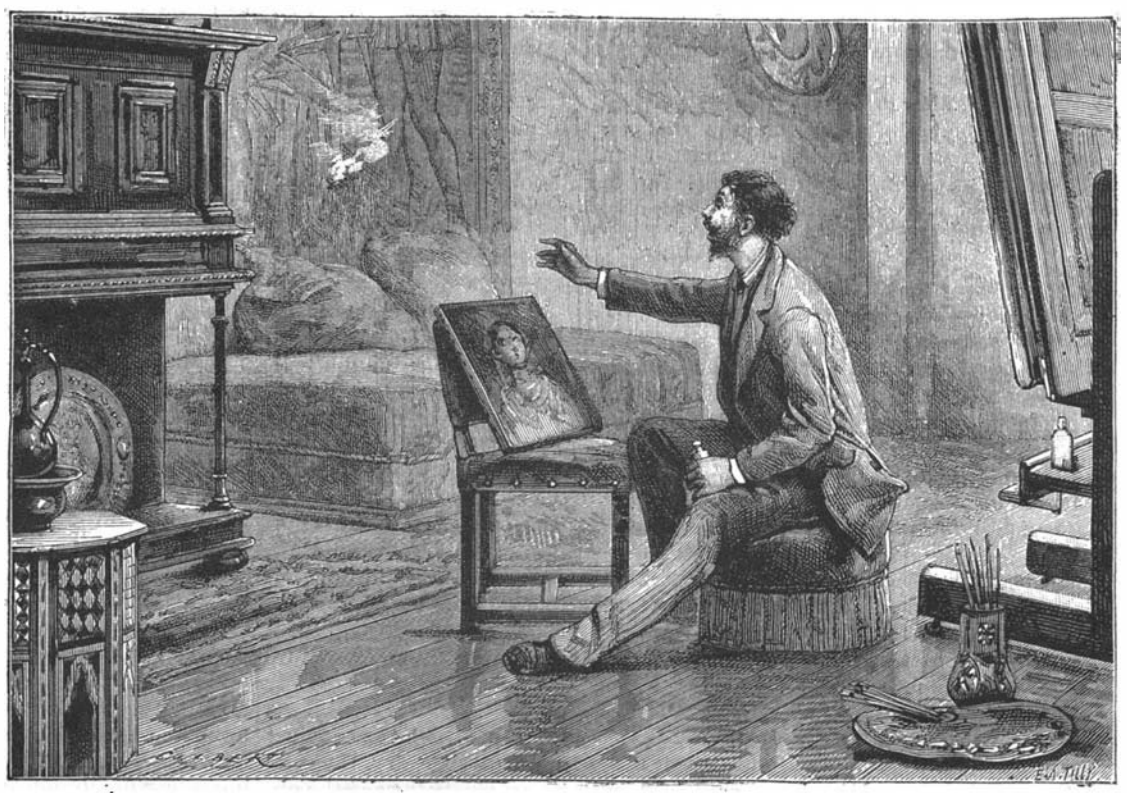
There are about three pounds of wire in each coil of the magnet.

SPONTANEOUS COMBUSTION.

In November of last year a force of men was sent aboard of the City of Newcastle to extinguish a fire in a cargo of cotton which had been generated by spontaneous combustion. An unsuccessful attempt to extinguish the fire had been made at Queenstown, the first port at which the vessel stopped.

Baled cotton and also cotton and fibers and rags that are saturated with oil are quite subject to spontaneous combustion. In five years 46 ships bound for Liverpool alone, and loaded with cotton, were burned either at sea or just before or after their departure. This figure is much too low, judging from the remarks of a rich English banker who is familiar with affairs in all parts of the world. Of the long list of vessels laden with cotton or grain, nine had just been burned in whole or part, and he added that it was necessary that steps should be taken to prevent the fermentation of cotton, which appeared to be more combustible at that period than usual.

The remarkable tendency which is observable in tissues and cotton when moistened with oil, to become heated when oxidation sets in, deserves particular attention, and especially so from the sad results that may follow negligence, caused too often by ignorance of the



A WAD OF COTTON TAKES FIRE SPONTANEOUSLY WHEN THROWN THROUGH THE AIR.

danger or ignorance of the necessary precautions. In the navy, for instance, every precaution is taken to avoid spontaneous combustion. Thus, all the officers are aware that before packing away the tarpaulins or oiled coats which the sailors wear in bad weather, it is necessary to see that they are thoroughly dried. They should not be packed together in too great numbers. Oils, when drying, undergo a change which is simply a slow combustion at low temperature. If this action is hastened by any cause whatever, it brings about a higher temperature, which may result in fire.

The experiment may be made of producing spontaneous combustion, even in a few yards of cotton cloth, by painting it with linseed oil. M. Chevalier cites an instance of this nature, in the sail room at the arsenal at Brest, where three cases (for sails) of canvas painted with oil had been laid one on the other, after having been dried in the sun two days. Each piece measured about ten yards. Whether in the sun or shade, or under cover or exposed to the air, these pieces of fabric, whether yarn or cotton, can readily take fire, but fortunately very soon attract attention from the dense smoke that is emitted. Cotton fabrics containing oil, however, do not alone take fire in closed chambers and in the holds of ships, for I have seen the phenomenon produced in open air. I witnessed a case in point near the railroad station of l'Ouest, in July, 1878, when the heat was very great. The lamp room is situated at the foot of the Rue de Rome and the Pont de l'Europe. There, in a large sack, were gathered all the useless, greasy rags that had been used for cleaning the lamps. One of these bags had been filled so full that the rags had fallen to the ground, and as I passed by I noticed an odor of burning rags, but after a careful examination discovered no cause for this. Passing the same place five minutes later, I found the odor stronger, and I discovered the rags were just bursting into fire. I called an attendant and showed him the fire, and it was very soon extinguished with the help of a pail of water.

M. Chevalier, in his memoir on fires, instances the experiments of Messrs. Golding and Humphries, who caused spontaneous combustion by shutting up a piece of fabric immersed in linseed oil in a closed box, where it was left for three hours. The fabric commenced to smoke, and as soon as the air was admitted burst into flame.

Messrs. Renouard and Rouen carried still further the experiments of Golding. They mingled a few pieces of oiled cotton with some dry cotton and then put the whole under pressure, and after a few hours fire was discovered. Every one is aware that when cotton is baled, it is subjected to an enormous pressure. If the cotton is greasy, or even damp, it ferments, becomes heated, and then ignited.

A curious instance was reported by Dumas to the Institute in 1844, and cited by M. Fonssagrives. An artist was rubbing with a wad of cotton a painting freshly varnished. When he threw the cotton away, it immediately took fire in mid-air. Later, at the Academy of Sciences in 1879, during a discussion concerning a fire in the floor of a laboratory of a certain botanist, M. Cosson, M. Dumas cited a number of cases which prove that the condensation of the air in porous and combustible bodies frequently produces combustion, if the temperature is sufficiently low. Among these he again cited the case of the wad of cotton taking fire in mid-air. A savant as prominent as Dumas, who repeats the same statement at an interval of thirty years, classes it evidently as an indisputable fact. The temperature of 80° or 100° in the hold of a vessel does not sufficiently explain the cause of a fire in a cargo of damp linen, hemp, manure, oats, grain, or cereals. It is necessary to take into consideration the changed conditions. The rise in the temperature is due to the condensation of gas and to the rapid and powerful oxidation. Thus charcoal, which is very porous, when shut in a closed atmosphere, absorbs a large proportion of gas, which condenses and produces heat.

I cite another case, not so well known: The waste from vulcanized rubber, when thrown, in a damp condition, into a pile, takes fire spontaneously. This occurred at the factory of M. Menier, at Grenelle, in France.

Messrs. Dumas and Chevreul, in treating of this subject of spontaneous combustion before the Institute, stated that when a package from China containing some fresh vegetable matter and some dried substances was opened, they took fire, even before their eyes.

M. Fonssagrives states that the temperature of boxes of figs from Barbary has been so raised by fermentation that you could hardly bear your hand upon them.

There is less surprise in the increase of heat in heaps of coal, whether in storage or in open air. These masses of coal, whether in the quay or in the yard, take fire, nevertheless, without a spark being applied. The complex composition of coal gives a sufficient cause for spontaneous combustion. It contains essential oils, sulphur, and, above all, phosphureted hydrogen and marsh gas, which is spontaneously combustible. The impalpable coal dust also adds another danger of combustion.—*La Nature.*

BRITISH MUSEUM.—At a recent meeting of the electing trustees of this institution, Professor Huxley was elected to the vacancy in the trust caused by the death of Mr. Beresford-Hope.

AN AUSTRALIAN CHLAMYDOSAURUS.

The menagerie of reptiles of the Paris Museum recently came into possession of an Australian lizard, of a singular appearance, which has not heretofore been received in a living state, and which is remarkable, by the presence on the sides of the neck of a broad projecting membrane, toothed along its edges, folding back after the manner of a fan, and, in a state of repose, lying along the neck and forming a sort of collar. This curious lizard is the *Chlamydosaurus kingii*, Gray. The two halves of the collar are continuous beneath the throat, but are separate on the dorsal side, where they slightly overlap. Each consists of a fold of skin covered with large carinate scales, and supported on each side by a subcutaneous thickening, having the appearance of cartilage, and also by a bony projection from the os hyoides that is situated between the two flaps of the fold. Peculiar muscles control the movements of this apparatus, which the animal can thus spread out or fold up.

CHLAMYDOSAURUS KINGII.

We do not think, however, that the animal can spread it out to its full extent, as the number of the radii that support it is too few, and observations made at the menagerie confirm this view. Our lizard, in fact, has at times erected its collar when some one has tried to seize it, but very incompletely.

We lack positive information as to the role that these cutaneous folds play, but, as they are of the same nature as those observed on the sides of the body in other lacertians, such as dragons, for example, or in certain mammals, such as bats, flying phalangers, etc. it is presumable that they serve for analogous purposes, and that they constitute an accessory apparatus of locomotion. In fact, this lizard is essentially a tree inhabiter. The individual seen by us was constantly perched, and it is probable that at the moment that it jumps from one branch to another, it spreads its collar, which serves as a sort of parachute. On another hand, it feeds chiefly upon insects, and perhaps seizes them as they fly, by jumping after them, and using its collar to increase and regulate the length of its leaps.

The chlamydosaurus, which is a great deal stronger, and especially much slenderer, than the lizard of Southern France, attains a total length of 30 inches from the snout to the tip of the tail, which latter is very long. Its legs are very strong, and its claws are curved and sharp, as they need to be in a climbing animal. Its motions are agile and have a certain abruptness. When at rest, it sits upon its haunches, and erects its forelegs and head, which it holds immovable, and seems to be making observations.

During the three weeks that our specimen remained at the menagerie, it absolutely refused all kinds of food, although the keepers offered it everything that they thought capable of exciting its appetite. At the end of this period it succumbed. It seemed to be absolutely harmless, and never tried to bite any one who endeavored to seize it.

Its color was dull, of a pale brown above and lighter under the belly, with irregular and darker blotches on the back and legs, and blackish rings around the tail. The teeth of its collar were white at the tip, and, from a distance, looked like two rows of pearls.

As regards zoological affinities, the chlamydosaurus is quite distant from the lizards of France, and belongs to the family of Agamians, which has few representatives in Europe and none in America. The only species of the genus known is the one under consideration which has hitherto been met with only in Australia and on a few islands to the north of that continent.—*La Nature.*

Milk Inspection in Massachusetts.

We glean the following from the annual report for 1887 of James F. Babcock, inspector of milk and vinegar for Boston:

The collectors are authorized by the statute to enter all places where milk is stored or kept for sale and all carriages used for the conveyance of milk, and to take samples for analysis from all such places or carriages. Samples taken by the collectors are put into clean and dry cans, each can being provided with a wooden stopper. Each can is numbered by being stamped upon the handle. At the time of collection a tag is filled out with the date, hour, name of dealer, locality, and all other necessary particulars, and is securely fastened to the handle of the can by means of a twisted wire. Each collector is provided with a small leather hand bag holding ten cans, which is the number of samples procured at a single trip. As the statute requires that return sealed samples shall be given, if requested, it is necessary that the collectors shall carry materials for this purpose. The sample bags are accordingly provided with compartments holding small glass bottles, etc.

The full list of articles which must be carried by the collectors on every trip is as follows: Ten sample cans with stoppers, ten bottles fitted with corks, bunch of tags for marking cans, bunch of tags for marking sealed samples, wires for fastening tags to samples, sealing wax, seal, spirit lamp, matches, lead pencil, and receipt book for signature of drivers receiving sealed samples. Thus provided the collectors visit different sections of the city at an early hour of the morning, sometimes starting out as early as 2 o'clock A. M., and await the arrival of the milk peddlers supplying the locality. When the collectors have obtained the requisite number of specimens they report at the office, and deliver their samples to the inspector or his laboratory assistant, by whom the necessary examinations and analyses are made. The person receiving the sample is required to place his initials upon the tag attached to the sample.

COLORED MILK.

Watered or skimmed milk has a peculiar blue color, when a thin layer is observed, and particularly that portion of the upper surface which is next to the sides of the containing vessel. This appearance is so noticeable, and the cause so well known, that dishonest milkmen have found it necessary to color such milk, by adding something to give a rich, creamy, yellow color. The coloring of milk is a practice of long standing. Dr. Normandy in his Commercial Hand Book of Chemical Analysis mentions it as early as 1850, and it had probably at that time long existed. It was common with Boston milkmen more than twenty years ago.

The use of color at that time was so general, that many whose milk was otherwise good felt obliged to use color when brought into competition with unscrupulous dealers whose watered product, disguised by color, appeared richer than their own pure article. One of the largest milk contractors in Boston has informed the writer that he formerly required farmers who sent him their milk to color it, and he not only instructed them how to do it, but sent them the color prepared for use. In 1880, Hon. Martin Griffin reported:

"The public has been so long accustomed to this false article that it is now difficult to know the color of honest milk, and very rare to have the opportunity of looking upon it. Attention was first called to this matter by observing the milk as it came from the country, and then seeing a different color in the milk as sold. The secret was soon known. The milk was pure in the first instance, and doctored or colored in the other. Dealers make no secret in the matter. Indeed, many of them complain that they are forced into the practice by their customers, who insist upon the colored being pure, and the white the impure; and that they have lost customers by leaving a pure, uncolored milk. Nor is this surprising; for people have so long been accustomed to this color, and been educated to the belief that the colored, creamy, brownish milk is the only good article, that they turn with disgust from the whitish, bluish tint of the pure product. By turning to the description of milk as given by Hassal, it will be found to be of a milky white or bluish tint. Hence any liberty taken with it exposes the spoliation of cream or the addition of water, and its poverty is apparent in the thin, watery appearance and bluish tint which are inevitable in milk thus treated. The adulteration is easily seen, and hence the purpose of coloring, to conceal the fraud by giving an artificial richness and color to hide the bluish tint."

The milk color at first used was prepared from molasses or brown sugar, and sometimes from honey. The application of heat to these substances converts them into a substance known chemically as caramel, and this body dissolved in water produces a dark brown solution which forms sugar color. It is still extensively used for producing fine, old (?) brandy or whisky from inferior goods, and for making so-called white wine vinegar into cider (?) vinegar. About 1879 another preparation was manufactured, and has since been sold in large quantities, which consisted of a solution of annatto color in potash or soda. The nature of this preparation, and the dishonest purposes it was intended to serve, may be gathered from the following letters from a manufacturer which came into the possession of the Massachusetts State Board of Health:

——, MASS., November 8, 1884.

DEAR SIR: I would like to call your attention to ——, for which I am the agent. It is the article which all milkmen in Boston and vicinity use to improve the quality of their milk, and help them out when milk is scarce. It is perfectly harmless, and the milk inspectors and State Board of Health cannot detect it in the milk. The amount of water you can add to your milk in one day without detection will pay for —— enough to use three months. If you have any friends in the business, please tell them of this.

Yours truly, —— ——

——, MASS., November 8, 1884.

DEAR SIR: Yours received. Sent by Adams express one bottle of "Benefit." Give it a good trial. Don't be afraid of the color, taste, or smell, as you will find it to be all right when in the milk. A sample of milk taken from a batch put up with "Benefit" and analyzed will prove to the inspector to be all right, as the "Benefit" counteracts the chemicals they have to use in the analysis.

DIRECTIONS FOR "BENEFIT."

Take a two-gallon can of cold water and add —— of salt, —— of brown sugar, and —— of "Benefit." Shake it up so as to dissolve the salt and sugar, and then add —— of water to —— quarts of milk. If you take off cream from the milk, add a trifle more "Benefit." Some use sugar only when sticking their milk pretty hard. It gives a good body, however.

Yours truly, —— ——

A bottle of this so-called "Benefit" was procured, and proved on analysis to contain a solution of annatto. It had a very offensive smell, and a nauseous taste. The label on this bottle is significant. It is as follows:

BENEFIT. KEEP STRICTLY IN THE DARK. Use according to judgment. Keep corked. Prepared by —— ——, P. O. Address, Pollard Square, Somerville.

The addition of such materials to milk, whether injurious or not, had long been prohibited, but the enactments had never been enforced; but the inspector was so fully persuaded that if the coloring of milk could be prevented, it could but have a marked effect in reducing the quantity of watered and skimmed milk which had hitherto been sold, that, after mature consideration, it was decided to notify all dealers that they would be liable to complaint if colored milk or milk containing any foreign substance, intended for sale, was found in their possession. The announcement of the decision of the department to enforce the law was received with considerable opposition. Several of the largest and most respectable dealers visited the inspector and declared that "the idea was impracticable. The color could not be detected; and the attempt to enforce the law would result in failure." Many milkmen, however, at once conformed to the requirements; but some persisted in doing otherwise, so that it became necessary to make complaints against a considerable number. Many of these complaints were most stubbornly contested, but finally resulted in a conviction in every case except one, where the jury disagreed. The defendant in this case, however, pleaded *nolo contendere*, and paid his fine in a subsequent complaint.

The reform so successfully commenced has been continued to the present time, so that colored milk in Boston is now a thing of the past. True, we still occasionally find it in a badly watered milk, but its general and almost universal use, as formerly, has ceased.

ANNATTO AND ITS DETECTION IN COLORED MILK.

Annatto is the name given to a dye drug prepared from the seeds of a tropical shrub, known to botanists as the *Bixa orellana*. The plant, originally a native of South America, was used by the natives as a dyestuff at the time of the discovery of America, and was made known in Europe soon after the conquest of Mexico by the Spaniards. Thomson, in his "Chemistry of Organic Bodies," describes the preparation of annatto as follows: "The fruit of the plant is a coccus containing thirty or forty seeds smaller than a pea, and having a vermilion red color. To extract this coloring matter the grains are rasped down, water is added, and the whole allowed to remain for some days. A sort of putrid fermentation takes place. The whole is thrown on a drain, and the water which holds the coloring matter in suspension is collected. The coloring matter gradually subsides." Dr. Thomson describes annatto as having no taste; but a disagreeable smell resembling that of putrid urine, and he adds in a foot note: "This smell is not natural, but is communicated to it in the magazines by adding to it urine from time to time, in order to keep it moist and improve its color."

Dr. F. Crace-Calvert, in his work on "Dyeing and Calico Printing," says: "It is imported from Mexico, Brazil, the Antilles, and especially from Cayenne, in masses varying in weight from 5 to 20 pounds, which are usually covered with banyan leaves or reeds. It is also imported as a homogeneous mass in casks weighing 4 or 5 cwt. The paste has a repulsive oder of urine, which is added by those who store it, to keep it moist and impart to it a brighter hue."

COLORED BUTTER.

For many years preparations of annatto have been used for coloring butter, those persons using it being in all probability ignorant of its sources and the disgusting means employed in its manufacture. A microscopic examination of paste annatto, or of the alkaline solution of it as employed for coloring milk, shows, as Dr. Davenport has recently reported, the presence of innumerable *bacteria*, a necessary result of the putrefactive changes through which the coloring matter has passed. It is not surprising, therefore, that milk to which even the smallest quantity of annatto coloring has been added should sour much more rapidly than pure milk—a fact which has long been known to milkmen, and many times acknowledged to the writer by milkmen of whom inquiries have been made.

The Glycerine Patent—the Supreme Court Reverses its Former Decision.

In 1854 Mr. Richard A. Tilghman, of Philadelphia, obtained a United States patent for the manufacture of glycerinic and stearic acid from ordinary fat, by the use of highly heated water alone, under pressure in a close boiler. The invention revolutionized the manufacture of candles in this country, and led to the production of glycerine at such a price as brought it for the first time into general use. He visited England and sold his patent to the Prices, of London, the great glycerine manufacturers. While engaged in the introduction of his invention into England, several large manufacturers in this country appropriated Tilghman's invention. Among them were R. G. Mitchell, of New York, and Proctor & Gamble, of Cincinnati. In 1858 Tilghman, through George Harding as counsel, sued Mitchell in the Circuit Court of New York. After many years of litigation that court gave Tilghman a decree sustaining his patent and ordering Mitchell to pay the sum of $250,000 damages.

From this decree Mitchell appealed to the Supreme Court of the United States. That court decided that Mr. Tilghman's patent was limited to a mere apparatus, and did not cover or control the broad process or principle of decomposing fat by highly heated water, and that as Mitchell had not used Tilghman's apparatus he could recover nothing, and reversed the decree of the lower court. Not daunted by this defeat, Tilghman prosecuted a new suit against Proctor & Gamble, of Cincinnati, who were using the same apparatus that Mitchell had used.

The circuit court in Ohio, following the decision of the Supreme Court, decreed that Tilghman could recover nothing, and dismissed his complaint. An appeal was again taken to the Supreme Court of the United States, and on this occasion Mr. Harding, representing Mr. Tilghman, presented the case to that court, and it unanimously reversed its former decision and decided that Mr. Tilghman was entitled to the patent for the principle or process, and that Proctor & Gamble must pay him for using it. The case was returned to Judge Baxter, in Ohio, to ascertain how much Tilghman should be paid. That judge decided that the rate which other licensees had paid Mr. Tilghman was the measure of his damage, and awarded to Tilghman $79,566.

From this award Tilghman appealed, claiming that the license fee which honest users paid should not be the measure of the amount which an infringer should pay, and that he was entitled to receive all the money savings which Proctor & Gamble had made by their wrongful use of the patent. The Supreme Court, in the decision just rendered, determined that the usual license fee of Tilghman was not the limit of the amount which he could recover, and awarded $266,153.86 as damages, with interest for three years and five months, amounting to $320,715. Mr. Tilghman was represented at the final argument by Messrs. Harding and Chambers, and the defendants by Parkinson and Ramsay, of Cincinnati.

The Sturtevant Rock Mill.

The method of reducing rock by this machine is novel and interesting, the material being hurled against itself with tremendous force, reducing it at once to powder, and the grinding which would otherwise be upon the mill is transferred to the material, thereby reducing the wear of the machine to a minimum. It is a combined crusher and pulverizer, and has been extensively introduced both in this country and in Europe for reducing ores, phosphates, cement, etc., with very satisfactory results, as the testimonials received by the manufacturers show. The capacity of these mills is marvelous. One of the largest cement manufacturers states that one 20 inch mill at their works crushes and grinds from 140 to 150 barrels cement per hour (equal to over 20 tons). Additional information and references can be had by addressing the Sturtevant Mill Co., 88 Mason Building, Boston, Mass.

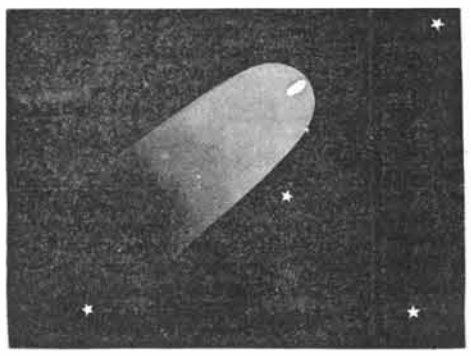
Correspondence.

THE NEW SOUTH AFRICAN COMET.

To the Editor of the Scientific American:

I was enabled to secure a good view this morning of the comet discovered by Sawerthal, at Cape Town, on February 18. At discovery it was too far south to be visible in northern latitudes. But its motion was northeasterly, and it may now be seen in the eastern sky, just before dawn. This morning its position was right ascension 21 hours 40 minutes; declination south, 5 degrees 15 minutes. It is now in the constellation Aquarius, and will soon move into Pegasus.

The comet is just visible to the naked eye, and in the telescope presents an interesting appearance, with a bright nucleus considerably elongated, as shown in the accompanying cut. The tail is short and very broad.



TELESCOPIC VIEW.

Although the comet is growing fainter, it may be easily observed with moderate telescopes for some time to come.

WILLIAM R. BROOKS.

Red House Observatory, Phelps, N. Y., March 25, 1888.

Ivy Poisoning.

To the Editor of the Scientific American:

Referring to the item in your paper by Mr. Heberling, who advises the use of baking soda—while soda *is* good to relieve the intense itching caused by ivy poisoning, it is not a sure cure by any means, as I have found fully as many cases that it would not relieve as cases that it did.

When a boy, I was repeatedly poisoned by ivy. At times soda relieved, and at other times was no better than that much water. It was a subject that interested me, and I studied it, and came to the conclusion that the condition of the blood had more to do with the case than the soda did. Further than this, I found that at times a person is poisoned more readily than others, and still at other times the leaves may be freely handled. Perhaps this is no news to you, but it may be to others. I have never found a *sure cure* for ivy poisoning, and would very much like to. Can you not give us one in your paper?

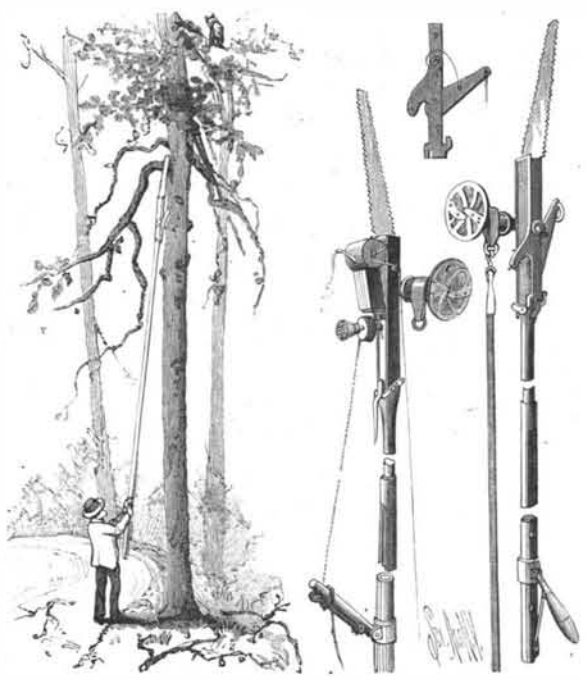
By the way, I can go back more than twenty-five years in the use of soda.

ARTHUR S. JESSOP.

Humboldt, Tenn., March 16, 1888.

AN IMPROVED PRUNING IMPLEMENT.

A device for use in the pruning of trees of almost any height, and for the dressing of the wounds caused by



BOSCH'S PRUNING IMPLEMENT.

the pruning, has been patented by Mr. Andreas Bosch, of Prairie du Chien, Wis., and is illustrated herewith. Its main supporting pole carries two studs to enter slots in the shank of a double-edged saw, the shank having a catch to engage one of the studs after the parts have been adjusted. The pole also has an adjustable slotted metallic sleeve, to which a lever arm is pivotally connected, this lever arm being connected by a cord with a wax reservoir, beneath which is a lamp and a brush, whereby the wounds caused by the pruning may be dressed with wax. To smooth and dress the limbs, a spring-operated disk, with two cutting blades, is mounted on a frame overlapping the upper end of the pole, a downwardly-extending cord connecting this disk with the lever arm of the pole. The construction is such that the saw may be used on both the upper and under side of a limb, the saw being reciprocated by the lever, which is connected to the pole, the slotted sleeve being firmly held. One of the views shows another cutter employed to sever small limbs.

The Sea Serpent.

The schooner Coral, Captain Sherman, is now at this port awaiting favorable weather to proceed to Greenport. To your correspondent Captain Sherman reported that recently, when his vessel was in the vicinity of Cornfield Lightship, there suddenly appeared astern and not two hundred feet away an immense sea monster that fully answered the description previously given of sea serpents.

Captain Sherman says he had a perfect view of the monster. He described it as being over one hundred feet in length, and in some portions its body was as large around as a flour barrel. The head of the serpent resembled that of an alligator. The captain called his mate, and they both watched the animal until it passed out of sight, in the direction of the mouth of the Connecticut River. It passed over the water at quite a rapid gait, and as almost the entire body was on the surface of the water, the men had a good view of the creature, and both feel confident that they saw a veritable sea serpent. Captain Sherman appears to be a thoroughly reliable man, and has been master of a vessel for fourteen years, during which time he has made several voyages to the Grand Banks, where almost all species of animals that inhabit the sea are to be found, but never before has he seen anything like the monster above referred to.—*N. Y. Herald.*

Tasmania Railways.

The island of Tasmania, or Van Diemen's Land, as it was formerly called, lies to the extreme south of Australia, between 40° 15′ and 43° 45′ south latitude, and between 144° 45′ and 148° 30′ east longitude. It is separated from Australia by Bass Strait, 120 miles wide, but it is in telegraphic communication with the Australian continent, and therefore with Europe, the Tasmanian and Victoria submarine telegraph being worked by the Eastern Extension Telegraph Company upon a guarantee from the Tasmanian government. The greatest length of the island is 230 miles, and its greatest width 190 miles. Its surface is estimated at 26,215 square miles, or almost the size of South Carolina. The total area, exclusive of islands and lakes, is 15,571,500 acres, or inclusive of these, 16,778,000 acres. The population at the last census in 1881 was 115,705, and it is estimated to be now close on 140,000 persons. Tasmania is a mountainous country, having hills ranging from 1,000 feet to 6,000 feet in height. It has several extensive lakes on the high central table land, and these form the sources of the chief rivers, of which there are several. The climate of Tasmania is very salubrious, and the island is recommended as a sanatorium for invalids, the hot north winds of Australia being tempered by the 120 miles of sea at Bass Strait. The chief products are tin and gold, wool, wheat, oats, barley, potatoes, timber, hops, fruit, jam, and whale oil. The government of Tasmania, with a view to encourage special manufacturing industries, have offered bonuses from time to time, of which the following are yet unclaimed:

Sugar from beet or other products grown in the colony, bonus $10,000, 200 tons to be manufactured in one year.

Salt.—On 300 tons being manufactured in one year, a bonus of $2.50 per ton for the first hundred tons, and $1.25 per ton for the second and third hundred.

Corn Sacks or Woolpacks.—Bonus $5,000. The quantity of sacking suitable for working up into those articles turned out in one year to be 40,000 yards.

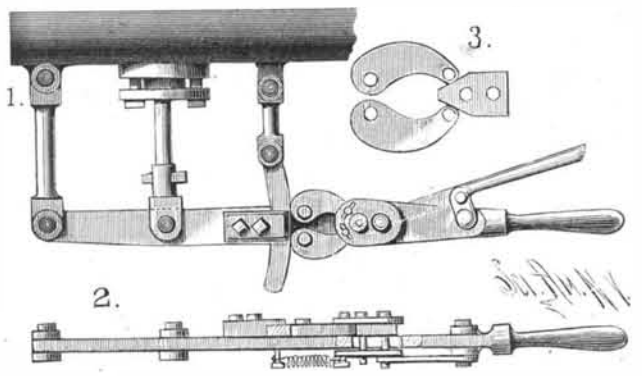
Up to about four years ago Tasmania was considered a sleepy colony, and was dependent upon Australia and England for the supply of most articles of general consumption. Now the country has awakened, trade is developing, and railways are extending in various directions. During the past three years no less than 27 jetties have been erected. Better vessels are visiting the ports of the colony, and large and handsome warehouses and business establishments are being erected in the chief towns.

The Pervasiveness of Lightning.

A correspondent of the Springfield *Republican*, describing the effects of a recent lightning stroke, says that "the ceiling of the room had been replastered the preceding spring, and the sand of this locality, which is used in mortar, is ferruginous. Every metallic particle in the latter the fluid seemed to have found and detached, so as to give the plastered surface an appearance better described as pock-marked than by any other words at my command."

A DEVICE FOR OPERATING THROTTLE VALVES.

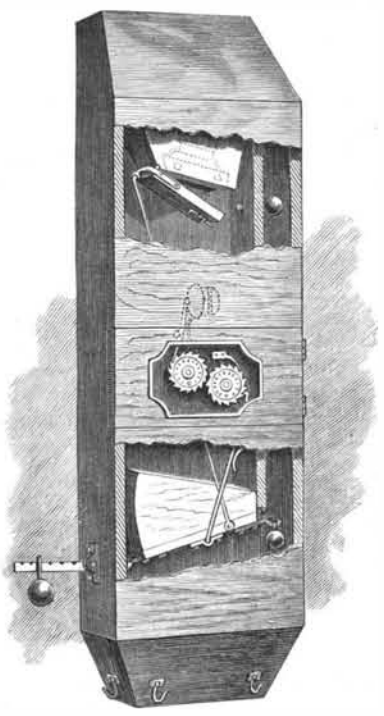
A device for use in connection with the throttle valves and reversing gear of locomotives and engines, for locking the valve lever and its connecting rod in any desired position, has been patented by Mr. Robert C. McArthur, of Hamilton, Ontario, Canada, and is illustrated herewith. A lever is pivotally connected at its outer end with a link pivoted to the boiler, and the rod which operates the throttle valve is pivoted to this lever, which also has a bearing supporting a segmental arm, pivoted on a link pivotally connected with the boiler. Cams, or friction clutches, as shown in Fig. 3, are pivoted to the lever, their eccentric lower ends operating on the periphery of the segmental arm, the upper ends of the cams resting against the edges of a wedge, which, with plates, are held on the lever, in connection with a spring. When the operator desires to change the position of the valve, he presses on the small handle lever, thus carrying the wedge backward, and disengaging the cams from the periphery of the segment, when the lever can be moved inward or outward, moving in like proportion the rod operating the throttle valve, the operator releasing his pressure on the small handle lever as soon as the desired position of the valve is obtained, when the spring operates through the plates and wedge upon the cams to again lock the lever to the segment. For further particulars with reference to this invention, address Mr. William D. Fitch, No. 100 James Street, north, Hamilton, Ont., Canada.



McARTHUR'S DEVICE FOR OPERATING THROTTLE VALVES.

AN AUTOMATIC GRAIN WEIGHER.

A grain weighing or measuring apparatus, applicable for use in connection with a separator or other machine from which flowing grain is to be weighed, is illustrated herewith, and has been patented by Mr. Joseph C. Morris, of Azalia, Ind. In a casing or box-like structure is arranged a feed chute, in the upper portion of which is a hopper, its mouth closed by a trap hinged to one edge, and having an outwardly-extending pivotally-connected catch arm adapted to engage a lever, upon which a weight is adjustably mounted. Slides with springs are arranged in connection with the hopper to stop the flow of grain when the trap is closed. At the lower end of the chute is a trap normally held in position by a weight, and having a spring-pressed catch, which, when the trap is closed, rests on the short arm of a lever, the long arm of which carries a weight which may be adjusted to regulate the quantity of grain discharged at each tripping of the trap. The upper trap is closed until a predetermined quantity of grain has been delivered to the hopper, when, by its weight, the trap drops, permitting the grain to fall into the chute, but the traps are so connected that this movement closes the lower trap until the proper weight of grain has been delivered thereto, as fixed by the adjustment of the weight, when the grain is delivered into a sack or bag hung upon hooks at the lower end of the casing, the upper trap closing and being held closed as the grain is being delivered. A registering apparatus is arranged in the front of the case and connected with a gong, which is sounded as predetermined quantities of grain pass through.



MORRIS' GRAIN WEIGHING MACHINE.

ENGINEERING INVENTIONS.

A feed water purifier has been patented by Messrs. George W. Allen, of Manchester, England, and Henry J. A. Bowers, of Acton, London, England. It has a scum plate for collecting impurities thrown to the surface by ebullition, there being a trough between the scum plate and feed pipe to collect the heavier as well as the lighter impurities to an external separator.

A boiler tube cleaner has been patented by Mr. George M. Robinson, of Baltimore, Md. It has a steam inlet pipe carrying a fixed valve, a cylinder being adapted to slide on the steam inlet pipe and having a cone fitting into the tube to be cleaned, the tubes being cleaned by the action of steam passing through the cleaner and directed to the inner surfaces of the tubes.

The utilizing of gas explosions as a motive force forms the subject of a patent issued to Mr. Thomas H. Bolmer, of New York City. The apparatus has an explosion chamber with pipes and valves for introducing an explosive material, igniting connections, and tubes through which the liquid used in transmitting power is admitted and ejected, the apparatus being designed to be applicable to the propelling of vessels, pumping, etc.

A piston has been patented by Mr. Amos M. Morrill, of Ravanna, Mo. The piston head consists essentially of outer expansible rings and an inner expansible ring arranged in connection therewith, spring heads being mounted in connection with the expansible rings, and a bolt arranged for connection with the piston rod, followers and flat or spiral springs being dispensed with, while the piston rod is accurately centered.

AGRICULTURAL INVENTIONS.

A listing plow or cultivator has been patented by Mr. Joseph S. Crum, of Stockdale, Kan. This invention provides a construction which can be readily connected to an ordinary cultivator frame, and adjusted at the connection to regulate the depth of the plows or shovels, the device being simple and efficient.

A potato digger has been patented by Mr. Peter A. Chippendale, of Lewiston, Me. It has a scoop plow adapted to be raised and lowered to suit the depth of the row, in connection with a novel construction of endless chain upon which the potatoes and earth are delivered, and in the operation of which the potatoes are separated and transferred to a bag.

MISCELLANEOUS INVENTIONS.

A stirrup attachment has been patented by Mr. Jacob G. Welcome, of Fort Bidwell, Cal. It is especially designed for use by constant riders, such as stockmen, etc., to impart an easy motion, and is so made as to detach itself from the saddle if the rider is thrown.

A measuring reel has been patented by Mr. Enos M. Thomas, of Cherry Grove, Pa. It is mounted on a fixed shaft, with friction washers, a feathered disk and handled nut, the reel having a registering attachment, and being more especially designed for use in lowering torpedoes into oil wells.

A milk gauge has been patented by Mr. John S. Elliott, of Bombay, N. Y. It consists of a rod or bar formed in sections, connected to be folded up and adjusted upon one another, and also extended and clamped, to be inserted in milk cans and adjustably held therein, to indicate the height of the milk.

A fish trap has been patented by Mr. Elijah W. Jenkins, of Milford, Mo. The main frame has a false bottom, and there are supplemental frames with pivoted entrapping wires hung in alignment with the fish entrances, with means for raising and lowering the false bottom, and other novel features.

A paddle wheel has been patented by Mr. Washington Bryant, of Franklin, Ark. This invention provides a construction wherein the paddles enter and leave the water in an almost vertical position, but when in the water present the greatest bearing surface thereon, the invention covering novel details of construction and the combination of parts.

A seal lock has been patented by Messrs. Warren B. Waldron and George C. Boller, of Folsom City, Cal. It is more especially designed for use on freight cars when they are in transit, the parts being so arranged that the lock cannot be opened or tampered with without first breaking or injuring the seal, the lock being used as an ordinary padlock.

A combination padlock has been patented by Mr. Edwin L. Drake, of Winchester, Tenn. The invention covers a novel construction and combination of parts whereby a simply made lock can be used with a great number of combinations, and one tumbler will not be likely to be turned by the frictional contact of the next tumbler.

An electric surface railway has been patented by Mr. John A. Enos, of Boston, Mass. It is of that class in which storage batteries are used, and the invention relates more particularly to the connections for taking the current from the conductors along the line for charging the storage batteries, and also to the driving mechanism for propelling the car.

A chicken brooder has been patented by Mr. Charles Houser, of East St. Louis, Ill. It consists of a rectangular box or case provided with a water heating apparatus, and within which is arranged a coil of steam pipes and a brooding and a hiding board, all so arranged that the overcrowding of the chickens in any particular spot will be prevented.

A match safe has been patented by Mr. Alanson Cary, of New York City. It is a holder for match boxes having an automatic clamp or claw, with internal penetrating teeth to engage the match box and positively prevent its withdrawal, the box being broken out of the holder when the matches are used up.

A blind stop or slat fastener has been patented by Mr. George W. Williams, of Brooklyn, N. Y. It consists of an apertured or notched segmental plate, adapted for attachment to either the slats or the frame of the blind, with a catch or locking device to engage with the plate, for holding the slats more or less open or wholly closed.

A conveyor has been patented by Messrs. Henry C. Krause and Benjamin Harris, of Lake Linden, Mich. It is a simple device for conveying grain, chips, minerals, etc., employing a reciprocating pipe or launder, having a feed pan secured to it, with a relatively stationary hopper leading into the reciprocating pan.

A supply tank for water closets has been patented by Mr. John Holden, of Taunton, Mass. The tank has an air reservoir with an apertured flexible bottom to which a tube is attached having an air inlet at the top, in connection with a lever and discharge valve, whereby the flow of water is prolonged or shortened according to the amount of air admitted.

An adjustable support for laundry tubs has been patented by Mr. Albert G. Robinson, of Brooklyn, N. Y. The invention consists of arms fastened to the frame and adjustably secured at their lower ends to the base supports of the tub, whereby the top frames can be easily adjusted to tubs of varying depth, and at the same time are held securely in place.

A pocket book clasp has been patented by Mr. Daniel M. Read, of New York City. A fastening plate is made to go on the body of the pocket book, formed with an open slot and provided with a retaining device for holding the locking stud in the recess, whereby the clasp may conveniently be opened with one hand by a downward and forward movement of the stud plate.

A cutting apparatus for mowers and reapers has been patented by Mr. John C. Voss, of Bedford, Ind. Combined with a finger bar having a way for the cutter bar is a grooved overlapping portion projected above the way, the cutter bar having a beveled rib on its upper side, with roller bearings between the rib and the overlapping portion of the finger bar, and other novel features.

A two wheeled vehicle has been patented by Mr. Frank W. Bowne, of Lincoln, Neb. The body has spring-suspended side bars carrying spherical-headed studs, sectional links being held upon the stud heads and other spherical-headed links connected to the side bars and engaged by the lower ends of the links, the mounting being designed to relieve the vehicle of "horse motion."

A machine for forming horseshoes has been patented by Mr. Charles L. Haight, of Poughkeepsie, N. Y. It has a plate supporting and carrying a forming die, in combination with stationary abutments and levers, with means for reciprocating the plate and die and the levers, the bar of iron from which the shoe is made being bent or folded around the reciprocating die.

A well drilling machine has been patented by Mr. William Manson, of Colton, Cal. It is designed to bore the well by a gravitating sand pump or tool, and has mechanism for raising and dropping a crown pulley with cable carrying a gravitating drilling tool, a spring in the bar on which the pulley is journaled lessening the jar and promoting the durability of the entire rig.

A combined reel handle and fishing reel has been patented by Mr. Abraham Coates, of Watertown, N. Y. The reel frame is adapted to screw into sockets upon the ends of the parts of the reel handle, the reel having a multiplying gearing to turn it, and a crank which may be transferred from the gearing to the reel itself, to secure both slow and fast winding, with other novel features.

A combination tool for loading cartridges forms the subject of two patents issued to Mr. Francis P. Devens, of Kansas City, Mo. It is adapted for loading the ordinary form of paper shell cartridge, and the device is designed to remove the exploded primers from the shell and apply new ones, and load and crimp the shell, in connection with an automatic shot and powder delivery apparatus.

An oil can has been patented by Mr. John H. Sutphen, of Huron, Dakota Ter. It has a false spring bottom and a valve in the spout with a spring-actuated rod attached thereto bearing upon the spring bottom, with other novel features, whereby the oil delivered from the can is under the complete control of the operator, and will be cleansed of grit and other impurities by a filter.

A clothes line holder has been patented by Mr. Andrew E. Norman, of Ishpeming, Mich. It consists of a board with a central face groove, having a dovetail metal strip along its center, with a cross bar and line-holding blocks, and other novel features, the line holders to be attached to opposite walls or supports to allow one or more lines to be stretched to form a clothes rack of any required capacity.

A buggy top has been patented by Mr. John D. Reed, of Julesburg, Col. The invention consists in a calash top vehicle having the combination of a transverse brace-connecting shaft journaled to the rear part of the seat and having braces fixed rigid at each end, with an actuating lever arm attached to have an oscillating movement in a vertical direction, with other novel features.

A system of irrigation has been patented by Mr. Augustin S. Haines, of Nashville, Iowa. It is designed more particularly for orchards or other tree-planted areas, and consists of a novel arrangement of pipes to be laid along the surface of the ground and connected to each other by couplings having water outlet passages, with other pipes driven or set into the ground receiving water from the distributing pipes.

A fountain brush for mucilage and other liquids has been patented by Mr. Allan C. Harrington, of Richmond, Va. It has a reservoir flattened at the bottom, so it will stand upright, and a tube on the opposite side holding a brush, there being a spring valve in the tube which opens when pressure is applied to the reservoir, the valve being adjustable to control the supply and for liquids of different density.

The producing of lithographic surfaces, or zincographic plates, forms the subject of a patent issued to Mr. Hermann Schoembs, of Offenbach-on-the Main, Germany. It consists in subjecting the zinc plates to the action of a mixture of nitric and sulphuric acids, and then to the action of an ammonia salt, in a manner described, after which the plates may be used in the same way as the ordinary lithographic stones.

A power hammer has been patented by Mr. Henry St. Lawrence, of Northampton, Mass. The connection of the hammer stock is such that the hammer will deliver a swinging yielding blow, the shock of which is taken up by an independent base, the base of the main frame being relieved of all undue shock and jar, while a forward or backward adjustment of either the anvil or the hammer may be obtained.

A sharpener for reaper and mower blades has been patented by Mr. Louis P. Sefton, of Toronto, Ontario, Canada. Its body is approximately diamond shaped in cross section, and both body and handle are formed integrally from a composition chiefly of emery, by subjecting it to heavy pressure in a mould, a steel wire link being embedded longitudinally in the body and handle at the time of moulding to give greater strength.

A brake for windmills has been patented by Mr. John Thompson, of Holland, Mich. A wheel is carried upon the inner end of the shaft of the wind wheel, and a band is arranged in connection with it, in combination with a curved and outwardly projecting arm adjustably secured to the vane and adapted to engage the band, so that when the vane is thrown out of the wind, the brake will be automatically applied to the wheel.

A machine for automatically putting hinges upon boxes has been patented by Mr. Andrew C. Bolton, of Brooklyn, N. Y. Combined with two sets of nail holders, and hammers or drivers therefor, is a receptacle for hinges and a chute leading therefrom to a point adjacent to the hammers or drivers, a feeding finger forcing the hinges into position for action by the drivers, with other novel features, making a simple and durable machine.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) J. D. asks how to make carbon paper or transfer paper. A. Mix lard to a paste with lampblack, rub this upon the paper, remove the excess with a rag, and dry the paper, which should be thin post or tissue paper.

(2) I. M. G. asks: 1. In Fig. 2, in your description of electric motor, in issue of March 17, is the iron wire which is wrapped on the spool insulated? A. It is partially insulated with shellac varnish. 2. Will it matter if more than one piece of wire is used, if they are twisted or joined together, and what is done with the ends of the wire? A. You may use several pieces, but the ends should be allowed to abut without being twisted. The outer end of the wire is held temporarily by shellac. 3. Will cotton cloth do to wrap the iron wire ring? A. One thickness of thin cotton cloth applied with shellac varnish or thin glue will answer. 4. What will be the result if the coils of the armature do not have the same number of convolutions? A. The machine will have an irregular action. 5. Will any other screws work as well as brass wood screws? Will ordinary telegraph wire do instead of Stubs' wire? A. Yes. 6. What is the rule of thumb? A. Virtually no rule at all. The meaning of the expression is that you should construct your machine by adapting one part to another as you proceed, without any special calculation. 7. In the field magnet, are the strips lapped over each other, or just brought up against each other? A. The ends of the strips should abut. 8. Will lead answer the same purpose as Babbitt or type metal? A. No. 9. What is to prevent the metal from filling up the entire opening and leaving no oil hole? A. Nothing; the oil hole is to be drilled. 10. How much space should be left between the field magnet and the armature? A. The smaller the space between the armature and the field magnet, the better. 11. Can the motor be run either way by reversing the current? A. No; it can be done only by shifting the commutator brushes.

(3) G. G. asks if there is any particular way to lace a quarter turn belt so as to have an equal strain on both edges of the belt. A. Begin on the outside of the belt at the middle, pass one end of the lacing through one end of the belt and bring it out through the corresponding hole of the other end of the belt, laying it diagonally off to the left. Now pass the other end of the lacing through the hole last used, and carry it over the first strand of the lacing on the inside of the belt, passing it through the first hole used, and lay it diagonally off to the right. Now proceed to pass the lacing through the holes of the belt in a zigzag course, leaving all the strands inside the belt parallel with the belt, and all the strands outside the belt oblique. Pass the lace twice through the holes nearest the edge of the belt, then return the lace in the reverse order toward the center of the belt, so as to cross all the oblique strands, and make all the inside strands double. Finally pass the end of the lacing through the first hole used, then outward through an awl hole, then hammering it down to cause it to hold. The left side is to be laced in a similar way.

(4) J. M. C. writes: 1. I have just made six cells, 1 zinc 1½ inches by 3½ inches, 2 carbons 1½ inches by 3½ inches. I want to know if they will turn, or more than turn, the motor described in March 17 issue? A. Your batteries will turn the motor, but will give very little power. 2. Can I construct a smaller one on the same principle? A. Yes; follow out the same general proportions. 3. Can I make the field magnet solid, either wrought or cast, and, if built up, are the joints broken just where they happen to come? A. Yes; when built up the joints are broken just as they happen to come. 4. How is induction coil made to suit as many of my cells as would be proper to use, in an ordinary medical battery? I would like to have working directions. A. For induction coils and very full directions for making, see SUPPLEMENT, Nos. 160, 166, and 569.

(5) E. H. L. writes: I am much interested in your admirable description of a small dynamo as furnished in SCIENTIFIC AMERICAN SUPPLEMENT, No. 600. I want such a one for running a single arc lamp, such as requires 50 Bunsen cells. This dynamo does not furnish E. M. F. high enough for such, I fear. Can it be wound with finer wire, and so made suitable for our needs without otherwise altering the dimensions? Perhaps you can also tell me where I could get such a one made complete, for a reasonable price, or of any other pattern that will answer. We want an experimental dynamo for general purposes as well as for the arc lamp of our projector. How high candle power does the dynamo furnish in an arc lamp? How will the light compare with an ordinary lime light? A. The dynamo, when made as described in the SUPPLEMENT, No. 600, will answer your purpose perfectly. To adapt it to an arc light, all you need to do is to connect all of the wires of the field magnet in series, then arrange the dynamo as a shunt machine, and add some resistance to that of the field magnet in the shunt, the amount to be determined by experiment. Then have the winding of the armature secured by a sufficient number of bands of brass wire to prevent its destruction by centrifugal action, also wrap the wires leading to the commutator cylinder with adhesive tape, and finally increase the electromotive force by increasing the speed to say 3,000 revolutions per minute. The light will be ample for projection. With a parabolic reflector it will be superior to the calcium light.

(6) G. R. F. asks the process of taking and using glue moulds. A. A good gelatine mould may be made in the following manner: Soak the best white glue in cold water for 24 hours, then drain off all the water. Melt the soaked glue in a water-jacketed kettle, then pour the glue upon the object, the latter being incased in a lead or pasteboard box. Let it cool for 12 hours, then separate the cast from the object. If the object be a statuette, a thread should be attached to the back, and extended out of the mould at both ends, so that it may be used for cutting open the mould after it is cooled, to permit of taking out the statuette. A good material for a mould is made in the following way: Dissolve 20 parts of fine gelatine in 100 parts of hot water, and add ½ part of tannin and the same amount of rock candy. It is said that a mould made of gelatine or glue alone may be made more durable by pouring over it a solution of bichromate of potash in water, 1 part of bichromate to 10 of water, and afterward exposing it to sunlight. Most objects require oiling slightly before being covered with glue or gelatine.

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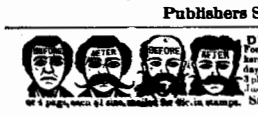

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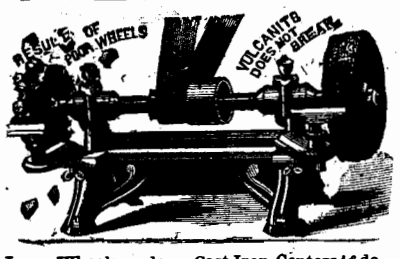

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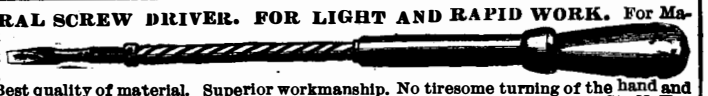

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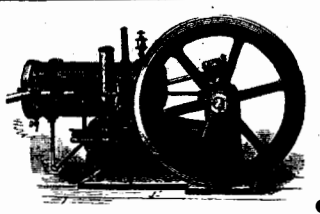

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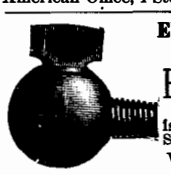

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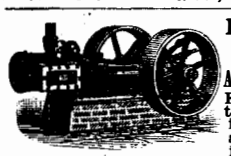

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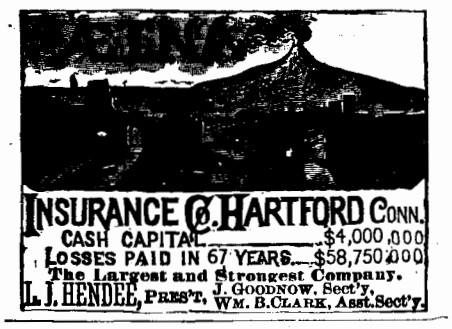

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