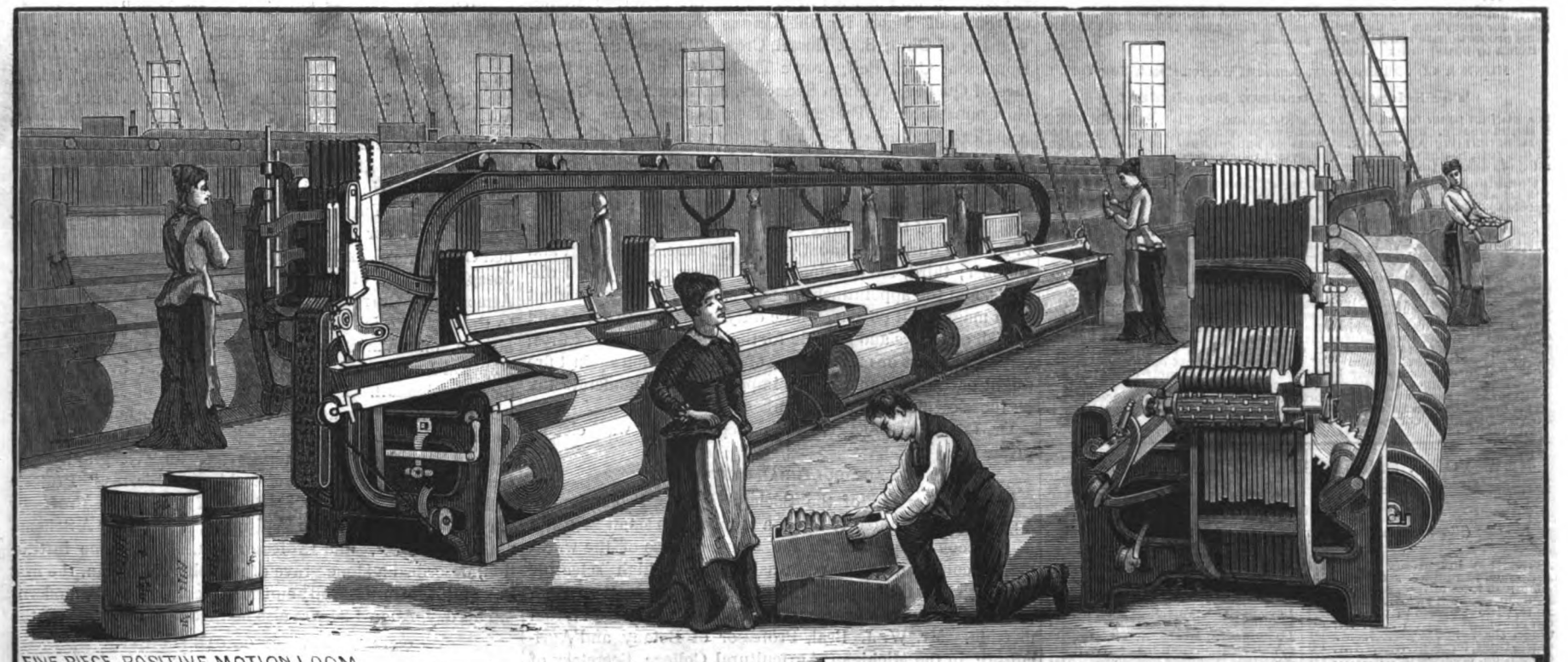
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLVII.—No. 10. [NEW SERIES.] NEW YORK, SEPTEMBER 2, 1882. [$3.20 per Annum. [POSTAGE PREPAID.]



LOOM WORKS OF J. & W. LYALL, NEW YORK CITY.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 261 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included..... $3 20
One copy, six months postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each: additional copies at same proportionate rate. Postage prepaid.
Remit by postal order. Address

MUNN & CO., 261 Broadway, corner of Warren street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5 00 a year, postage paid, to subscribers Single copies, 10 cents. Sold by all news dealers throughout the country

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of *seven dollars*. Both papers to one address or different addresses as desired.
The safest way to remit is by draft, postal order, or registered letter.
Address MUNN & CO., 261 Broadway, corner of Warren street, New York.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.
The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 261 Broadway, corner of Warren street, New York.

NEW YORK, SATURDAY, SEPTEMBER 2, 1882.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 348,

For the Week ending September 2, 1882.

Price 10 cents. For sale by all newsdealers.

THE MONTREAL SCIENTIFIC MEETINGS.

Montreal is the summer gathering-place of American science this year, the convention of the American Association there having been preceded by a Congress of Foresters, August 21–23, and a meeting of the Association for the Promotion of Agriculture, August 21.

Undaunted by the ill-success of their first gathering at Cincinnati, four months before, the promoters of the

AMERICAN CONGRESS OF FORESTRY

came bravely forward to the number of two hundred or more, with many papers on subjects relating to the culture and conservation of forests. Among the members present were Dr. Franklin H. Hough, Chief of the Bureau of Forestry at Washington; Dr. Charles Mohr, of Mobile, Ala., of the Census Bureau, who assisted in preparing the forestry statistics of the Gulf States for the Census Bureau; Dr. John A. Warder, of Ohio; S. J. Russel, Crown Timber Agent for the Dominion; C. E. Bell, Crown Timber Agent for the Province of Quebec; William Saunders, representing the Ontario Government; and Professor Albert S. Bickmore, of the American Museum of Natural History, in New York. The Committee on Forest Fires presented a report recommending, first, the reservation of all pine and spruce lands unfit for settlement for lumbering purposes exclusively; second, the prohibition of the burning of brush by settlers in the vicinity of fir trees during the months of May, June, September, and October; third, the division of the timber country into districts, and the appointment of police, under a superintendent with magisterial powers, whose duty it shall be to detect and punish offenders and provide for the extinguishment of fires; fourth, the cost of maintenance of this protection against fire might partially be met by the imposition of a moderate tax on those owning or leasing timber lands.

Dr. Loring, of the Agricultural Department, was elected president.

THE AGRICULTURAL CONVENTION.

The membership of the Society for the Promotion of Agriculture is limited to forty, a number too small to admit of its becoming popular in the broader sense of the word; yet its contributions have usually been of high scientific value, so that the quality of its work may more than compensate for any lack in quantity. This was its third annual meeting. Mr. W. J. Beal, Professor of Botany and Agriculture in the Michigan Agricultural College, Secretary of the American Pomological Society, and President of the Society for the Promotion of Agricultural Science, occupied the chair. Among those present at the opening were C. Lewis Sturtevant, Director of the New York Agricultural Experiment Station, who officiates as Secretary of the Society; L. B. Arnold, Lecturer on Dairy Husbandry, of Cornell University; George H. Cook, Professor of Chemistry and Agriculture in Rutgers Scientific School, and State Geologist of New Jersey; B. D. Halsted, editor-in-chief of the *American Agriculturist;* Levi Stockbridge, President and Professor of Agriculture in the Massachusetts Agricultural College; W. W. Tracy, Professor of Botany and Entomology, Superintendent of Garden Mission University, Secretary of the Mississippi Valley Horticultural Society; John Dougall, and a number of others.

Four new members were elected: Major Alvord, of Houghton Farm; Dr. Dabney, Director of the North Carolina Experiment Station; Professor C. V. Riley, of Washington, and Dr. Ormsby, of the Storis Agricultural School, making the total membership thirty-eight. Papers were read by Professor Arnold, on "The Origin of Butter Fats;" by Professor Caldwell, on the "Maintenance Ration;" by Professor Tracy, on "Seed Testing and the Influence of Light and Air on the Germination of Seeds;" by Professor Gully, of the Agricultural College of Mississippi, on the "Food Value of Cotton Seed;" and by Dr. E. W. Hilgard, on the "Absorption of Moisture by Soils." Among the other papers contributed were "Mineral Constituents in Plant Growth;" "The Yellows in Peaches;" "Non-albuminoid Nitrogen in Timothy in Different Stages of its Growth," by Professor W. H. Jordon; on "Vaccination," by D. E. Salmon, Veterinarian of the Department of Agriculture, and others.

THE AMERICAN ASSOCIATION.

The thirty-first meeting of the American Association for the Advancement of Science began August 23, with a large attendance of members and many prominent visitors. Among those from Europe were Dr. Samuel Houghton, and Professors Fitzgerald and Ormsby, of Trinity College, Dublin; John Rae, of London; Dr. Gilbert, President of the Chemical Society; Dr. Phine and Professor Wiltshire, of London; Professor Ernest Cook, of Bristol; Dr. Kowalesky, of Moscow; Dr. Szabo, of Hungary; Dr. Koenig, of Paris; and Professor William B. Carpenter, the eminent microscopist, from London.

After the brief address of welcome by Dr. Dawson, President-elect, a review of the growth of Montreal and of the growth of the association since the meeting of the association there twenty-five years ago, was given by Dr. T. Sterry Hunt, who expressed the hope that by another quarter century, or less, a meeting might be held in the City of Mexico.

The scientific work began in the afternoon with the customary addresses of the Vice-Presidents of Sections. The addresses were as follows:

Professor T. C. Mendenhall, of Columbus, section of Physics; Professor H. C. Bolton, of Hartford, section of Chemistry, on "Chemical Literature; "Professor William P. Trowbridge, of New Haven, section of Mechanical Science; Professor William H. Dall, of Washington, section of Biology on "The Biology of American Mollusks;" Professor A. H. Little, of Columbus, section of Histology and Microscopy; Professor Daniel Wilson, of Toronto, section of Anthropology, on "Some Physical Characteristics of Native Tribes of Canada;" and Professor B. Elliott, of Washington, section of Economic Science and Statistics. The address of Professor William Harkness, section of Mathematics and Astronomy, on the "Transit of Venus," was read by Professor Eastman. The paper of Professor E. T. Cox, of San Francisco, section of Geography and Geology, was given the next day.

In the evening, the retiring President, Professor George J. Brush, delivered the customary address. His subject was "The Progress of American Mineralogy."

The next morning, Dr. Carpenter, of London, gave, in the section of Histology and Microscopy, a lecture on "Angular Aperture in Relation to Biological Investigations," taking the ground that a dissolving lens of wide angle is not so good for general biological work as a lens of more moderate angle and higher defining power. During the day papers were read by Professor Samuel Lockwood, of Freehold, N. J., on "The Mastodon in New Jersey;" Professor Meehan, on "The Fertilization of Yucca;" Professor Elliott, on "International Time;" Professor Brewer, on "The Apparent Size of Magnified Objects;" W. L. Stevens, on "Vision by Electric Spark;" Joseph Letoile, of Ottawa, "A Review on Subjects of Atmospheric Currents, Electricity, and Gases, with a view to Practical Aerial Navigation by Balloons;" and Professor Mupan, on "Variations in Nature." A paper on, "How Physical Law should be Taught," was read by Vice-President Mendenhall. Professor Trowbridge, of Harvard University, delivered an address on "The Importance of Experimental Research in Mechanical Science." Vice-President Cox, of San Francisco, read a paper on "Geography and Geology: Topography of the Rockies and Sierras." Professor Hall read an address on "Shells of America." Professor Mason, of the Smithsonian Institution, presented "A Scheme of Anthropology," and Professor Rau, of the same institution, described a stone grave of a Kaskaskia Indian, the first find of this form of burial among natives known to be modern.

This day, August 24, was also marked by an assembly of the

ONTARIO ENTOMOLOGICAL SOCIETY.

An address was delivered by the President, William Saunders, editor of the *Canadian Journal of Entomology.* Many prominent entomologists from the United States were present, including Professor C. V. Riley, of Washington; Dr. Hagan, of Cambridge; Dr. J. Lintner, New York State Entomologist; Dr. J. H. Comstock, of Ithaca; and B. Pickman, of Maine.

THE KEELY MOTOR DECEPTION.

Mr. William Boekel, mechanician, has reported the results of his instruction by Mr. Keely, as required by the Court of Common Pleas in Philadelphia, and the stockholders of the Company are as wise as they were before.

The report was filed August 23, and runs in part as follows:

"First—That Mr. Keely has discovered a new force or motive power.

"Second—That the force or substance evolved by him through the instrumentality of his structure, designated by him under the varying nomenclature of 'vaporic force,' 'etheric force,' and approximate designations, possesses properties peculiar to itself, and wholly phenomenal in character, differing essentially in many particulars from those of compressed air or other gases, and requiring special machinery for its proper utilization."

Mr. Boekel begs for more time for Mr. Keely to perfect the utilization of his discovery, and for himself to enable him to master the subject so as to be able to give such a technical description of the motor as the law requires before the issuance of a patent. Though Mr. Keely, he thinks, has so far perfected his invention as to entitle him to Letters Patent, yet he (Mr. Boekel) does not yet "possess that intimate degree of knowledge of the entire subject to make it expedient, in his judgment, to recommend that the Court should now order such application to be made."

Those who have followed the history of this deception will remember that Mr. Boekel has been associated with Mr. Keely from the first, and has repeatedly given testimony quite as valuable as the foregoing. In 1874 he was one of the signers of the report of tests, on the strength of which the first stockholders were led to put money into the enterprise. In 1875 he wrote a letter (printed in this paper July 17, 1875), in which the correctness of Mr. Keely's claims were certified upon "personal knowledge," and "intimate knowledge of the construction of the machine and its operation."

It is strange that the company should expect, or pretend to expect, from such an old ally of Mr. Keely, the information they are ostensibly seeking. In 1875, Mr. Boekel professed to have intimate knowledge of the subject; now after years of experience and a long course of special instruction by Mr. Keeley, he professes a lack of such knowledge. Whether the change is due to poverty of memory, or to the bewildering character of Mr. Keely's teaching, does not appear. But it is pretty certain that somebody pulled wool over the eyes of the stockholders in getting Boekel appointed as their representative. It is practically the same as if poor Keely himself had been appointed.

ASPECTS OF THE PLANETS FOR SEPTEMBER.

VENUS

is evening star, and retains her ascendency throughout the month as brightest of the starry throng. A careful observer will readily notice her increasing size, her diameter now nearly measuring twenty seconds, while at the end of the month it will measure twenty-six seconds. It must, however, be remembered that the more her diameter increases and the more nearly she approaches the earth, the less of her enlightened disk is turned toward us. If when, in December, she passes between us and the sun, her enlightened disk were turned towards us, she would indeed be an object glorious to behold.

The progress of Venus in September is made specially interesting by the occurrence of an important epoch in her course. On the 27th, at two o'clock in the morning, she reaches her greatest eastern elongation, or most distant point from the sun on his eastern side. Those who have taken note of her steps since her superior conjunction with the sun on the 20th of February, when she commenced her role as evening star, saw her about two months later as a faint star close to the sun for a short time after sunset. For seven months she has been traveling farther from the sun, setting later every night, and growing more brilliantly beautiful. She will, on the 27th, reach the end of the invisible chain that binds her to the sun; the golden bead strung on the celestial wire has reached the limit of its length.

Not a second farther she can swerve. The resistless attraction of the great luminary turns her course and directs her retrograde steps westward, until, in our view, she has retrod the eastward course, and arrived at her inferior conjunction and transit. Millions of observers are watching her receding steps with eager interest, for the goal toward which she hastens ushers in the great astronomical event of the year.

Venus at elongation is 46° 36′ east of the sun. As 15° represents one hour of time, and it is possible for her to move farther from the sun than an average distance of 45°, it will be seen that she can never be visible much more than three hours after sunset. As the same laws prevail in reversed order when she is morning star, for the same reasons, she can never be seen more than three hours before sunrise.

The increased velocity of the planet's motion after elongation is also to be noticed. While she has been nearly seven months in passing from superior conjunction to eastern elongation, she will be less than three months in passing from eastern elongation to inferior conjunction. In the former case the motion is direct, or in the order of the signs; in the latter case the motion is retrograde, and the planet appears to move faster. This most brilliant part of her course will form a planetary study for the student of the stars, as easily followed as it is interesting and illustrative of the laws that govern the inner planets as they oscillate in straight lines east and west of the sun.

The work of getting ready for the Transit of Venus goes on with increasing ardor as the time for the occurrence of the phenomenon draws near. At a moderate estimate, nearly a hundred transit expeditions have either arrived at their destinations, are on their way thither, are diligently making ready for their observing points, or are strengthening their resources at home. American astronomers are perfecting their plans. The Commission having the arrangements in charge has been obliged to wait long for an appropriation from Congress to defray the expenses. But the starting-points have been selected, and the leaders of the different parties have been chosen. There will probably be four stations in the Southern hemisphere. One is at the Cape of Good Hope, under Professor Newcomb; one at New Zealand, under Edwin Smith, of the Coast Survey; one at Santiago, Chili, under Professor Boss; and one in Santa Cruz, Patagonia, under Lieutenant Very, of the United States Navy. Some of the stations in this country will be Cedar Keys, Florida; San Antonio, Texas; and Fort Thorn, New Mexico. The directors will be Professors Hall, Harkness, Eastman of the Naval Observatory, and Professor Davidson of the Coast Survey.

Thus it will be seen that the United States will be worthily represented by some of her most famous astronomers, who will do valiant work for the cause. Photography is the weapon with which they will make their attack upon the sun, and the fairest of his family, and, if human skill can be relied upon, the sun himself will be made to record every feature of the transit. The French, who will observe at eight stations in the Western world, depend upon contacts for their means of attack, as also do the English and Belgians, while the Germans hope to accomplish great things with the heliometer. The Germans thus far have selected two stations farther north than those chosen by other foreign nations; one is at Hartford, Conn., and one is at Aiken, S. C. The uncertainty of the weather in the north temperate zone will prevent it from being extensively chosen as an observing locality, but some stations will be located there, in order to bring the observers at as widely separated points as possible. It is discouraging to think, that at only half of the stations clear weather may be anticipated, and that this expenditure of time, labor, and means will be all in vain as regards half of the observers. But the other half will have their labors crowned with a brilliant success, that will make up for the disappointment of those who equally serve the cause, though they "only stand and wait," while the whole band of observers will be rewarded by the gratitude of the generations that will tread the earth during the one hundred and twenty-two years that must intervene before the year 2004, when an another transit recurs.

Venus sets on the 1st a few minutes after eight o'clock in the evening; at the end of the month, she sets not far from half past seven o'clock.

MERCURY

is evening star, and wins the second rank on the planetary roll, on account of the incidents he contributes to diversify the annals of the month. On the 28th, at six o'clock in the afternoon, Mercury reaches his greatest eastern elongation, the day after Venus has touched the same point in her path. He is then 25° 54′ east of the sun, while Venus was 46° 36′ at her elongation the day before. Although at nearly his maximum distance from the sun, he is not favorably situated for observation on account of his southern declination, for the farther north the planets are the better is the opportunity for observing them. It is, however, the last time during the year when there is the least probability of his being visible as evening star.

The present will be an unusual opportunity for comparing the respective limits the two planets reach, as they travel eastward from the sun, and it will therefore reward diligent painstaking to obtain a sight of Mercury. The moon will be greatly in the way, and will make it difficult to pick him up before elongation, but he may be looked for immediately after. Venus will show her bright face in the west almost as soon as the sun has set, and will greatly help in finding where to look for Mercury. He will be found about midway between Venus and the sun, seven degrees farther north than Venus. He sets on the 28th, about half-past six o'clock. Venus sets on the same day, about half-past seven o'clock. An opera-glass will do good service in discovering the smallest of the planets, after the point in the sky where he may appear is approximately calculated.

On the 20th, Mercury is in conjunction with the first magnitude star, Alpha Virginis, better known as Spica. The point of nearest approach between the star and the planet occurs at eleven o'clock in the morning, when they are only twelve minutes apart, Mercury passing north. The time to look for them will be on the evenings of the 19th and 20th. On the former evening, Mercury will be west of Spica; on the latter, he will be east of the star. The scene of the conjunction between Venus and Mars in August will be repeated with different actors in the parts. A good opera-glass, or a small telescope, will bring the stars into the field, Mercury's position differing little from that marked out for the 28th. The Lone Star, as Spica is sometimes called, and the little planet will make a rare and beautiful picture on the twilight sky. Mercury sets on the 19th, a few minutes before seven o'clock, about three-quarters of an hour after the sun.

On the 21st, Mercury is in conjunction with Mars, at one o'clock in the morning, passing a little more than two degrees south. It is barely possible that bright-eyed observers may obtain a view of the planets near conjunction on the evenings of the 20th and 21st, if the sky be exceptionally clear. Mercury is then ten degrees south of the sun, eight degrees north of Venus, and about two degrees and a half south of Mars. This active planet, besides reaching his eastern elongation, and playing a part in two conjunctions, is in his descending node on the 6th, and in aphelion on the 16th. Thus, it will be seen that he is a busy member of the family during September.

Mercury sets now a few minutes after seven o'clock in the evening; at the close of the month he sets about half-past six o'clock.

JUPITER

is morning star, but wins the third place on the list for the importance attached to his movements, and the fact that he reaches quadrature on the morning of the 23d. This magnificent planet then hangs self-poised, midway between conjunction and opposition, ninety degrees from each point, rising about midnight.

The sky in the early morning now presents a charming picture, the beautiful scene amply repaying the early riser for the effort required in order to witness it. Saturn leads the starry host as he mounts to the meridian. He is almost in line with the glimmering Pleiades, while ruddy Aldebaran glows below him. The princely Jupiter appears farther north than his brother planet, heralded by the brilliant Capella, and followed by the mighty Orion. It is seldom that the planets are attended by a court of such eminent rank, and every lover of the stars should behold the fascinating spectacle at least once during the month.

Jupiter rises on the 1st about twenty minutes before twelve o'clock in the evening; at the close of the month he rises about ten o'clock.

SATURN

is morning star, and ranks fourth in importance on the monthly roll, though his path is marked by no incident of interest. This grand member of the solar family is steadily coming nearer, and has so far advanced towards his nearest approach or opposition, that at the end of the month his serene face will come glowing above the horizon at eight o'clock, to be followed two hours later by the more imposing mien of Jupiter. For two months to come the two planets, though not near in reality, will be inseparably linked in the attention of the observer, who will gladly welcome their appearance in the evening sky, though they are still included in the list of morning stars.

Saturn now rises a few minutes before ten o'clock in the evening; at the close of the month he rises a few minutes before eight o'clock.

MARS

is evening star, and scarcely worth mentioning for any part he plays in September. Contented with the laurels won in August, when he played the subordinate part in the lovely pictures with which, in connection with Venus, he diversified the evening sky, as now approaching, now hanging in close vicinity, and now receding, the two planets crossed the celestial track with devious steps. We have already alluded to the conjunction of Mars and Mercury on the 21st. By the end of the month, the ruddy planet will become invisible to mortal view, for, setting only a half-hour after the sun, he is eclipsed in the solar rays.

Mars now sets about twenty minutes before eight o'clock in the morning; at the close of the month he sets not far from half-past six o'clock.

NEPTUNE

is morning star, and retains his place as the herald of the morning trio, pursuing his unseen course without an event worthy of record. Those who would trace his place on star-maps, will find it, on the 1st, in Right Ascension 3h. 7m., and in declination 15° 42′ north.

Neptune rises now about half-past nine o'clock in the evening; at the end of the month he rises about half-past seven o'clock.

URANUS

is evening star until the 11th, when, at three o'clock in the afternoon, he comes into conjunction with the sun, and is morning star for the rest of the month. He is the last of the four giant planets to reach this goal, turning the point when they are far on their way to opposition. At conjunction he is joined with the sun, rising and setting with him, and as completely hidden from human gaze as if he were blotted from the sky.

Uranus sets on the 1st a few minutes before seven o'clock in the evening; at the close of the month he rises about half-past four o'clock in the morning.

THE MOON.

The September moon fulls on the 27th, twenty-six minutes after midnight. It is the superb harvest moon, one of the crowning glories of the autumn. On account of the position of the ecliptic in regard to the equator, she rises for several consecutive evenings with only a comparatively short interval of time intervening, and thus seems to prolong the day, as she pours her floods of silvery light over the perfection of nature's handiwork, the harvest of the year. Poets have always sung the praises of the harvest moon as the surpassing wonder of the autumn nights, but, in our view, the winter moon, as she "runs high" in the heavens in the crisp, cool nights, is the most beautiful moon of the year.

The waning moon is in conjunction with Neptune on the 2d, with Saturn on the 3d, with Jupiter on the 5th, and with Uranus on the 12th. The new moon of the 12th is in conjunction with Mercury and Mars on the 14th, and with Venus on the 16th, passing a degree and a half north of the radiant evening star, and thus giving to observers a view of one of the most lovely pictures the heavens present—the silver crescent, near the fairest of the stars.

THE TELESCOPE.

Venus and Mercury will lose the gibbous phase when they reach elongation, both presenting the appearance of the moon at the last quarter, half the disk being illumined. They will soon after take on the crescent form like the waning moon, and Venus will then become an object of increasing telescopic interest. The near approach of Mercury and Spica will be an interesting study, for it will bring in contrast the crescent of the planet and the unvarying point of light characteristic of the fixed star in the largest as well as the smallest telescopes.

September cannot be called a monotonous month on planetary annals. It presents to the student of the stars studies of exceeding interest. Venus and Mercury reach their greatest eastern elongations within a day of each other. Mercury appears in the twilight sky in close conjunction with a star of the first magnitude, the "lone" Spica, and again plays a part in conjunction with Mars. Jupiter reaches his half-way house, and, thenceforth, as we see, the stars hangs nearer the earth than the sun. He holds his court in the early morning, amidst a galaxy of stars that makes the star-lit sky tremulous with brightness. The four-days-old moon, in conjunction with Venus, illumines the western sky with one of the loveliest pictures of the month. The harvest moon makes the nights of her sway among the most charming of the year. She reminds observers that fresh clouds have again been seen by the same observer floating over the Mare Crisium, and inspires the hope that the changes that have been noticed from time to time in lunar scenery may be substantiated by farther observation, and result in discoveries of startling interest concerning our nearest celestial neighbor and companion sphere.

Fast Packing of Shingles.

A shingle packing contest for a $200 prize was lately decided at Saginaw, Mich. Jack Lyons gained the victory, after ten hours of steady and rapid work, with a score of 59,250. He was closely pursued by Robert Scott, who packed 59,100 shingles.

LYALL'S POSITIVE MOTION LOOM.

In a former issue of this paper we gave the first published description of Mr. James Lyall's invention. We now take occasion to give our readers some idea of the growth of an industry then in its infancy, and to show how all we then predicted of it as one of the most remarkable products of inventive skill of our time has been realized.

We present illustrations of the exterior and interior of the machine shop where the looms are constructed, forming only a part of the premises owned and occupied by the firm, and where in all are employed from twelve to fifteen hundred employes. The number of looms built by them in the course of a year may be conjectured from the size of the works and the number of hands employed. It is a large and steadily growing interest, sprung from the inventive skill of one man. Another picture is given of a two-piece loom with hundred-inch reed spaces for weaving patterns, known as a Jacquard loom, and having Mr. Lyall's positive motion shuttle, thus bringing together two of the three inventions which we shall show to be all that there is of the loom to-day, in contrast to that of many centuries ago; also a four and a five piece loom. These very perfectly present to the eye the construction of the machine and arrangement of the works.

They are shipped to all parts North and South, South America, and Europe. China and Japan have them, in consequence of the report of an imperial commission sent here to inquire into their excellence. Indeed, wherever looms are used, they have been steadily supplanting those formerly in use for all kinds of weaving, whether of the coarsest fabrics or the most delicate silks, textiles of the fineness of spider webs, or screens of iron wire. Diplomas, medals, and decorations attest the high appreciation in which the invention has been held.

The reason for this pre-eminence will become clear upon a brief inspection of the loom itself in operation. It will afford those interested a pleasant hour to read the history of weaving from its rude beginning. Concluding with this description of the loom *as it is*, they will be impressed with the fact that Mr. Lyall's invention has made that radical change in the possibilities of weaving which the hot-air blast did in the manufacture of iron—simple enough in contrivance after it has been discovered, but so marked, so radical in character, that it amounts to the creation of a new art—a new art in the sense that it produces, in a new and better way, an article in all respects different from the old article, except in the fact that both are known as fabrics.

The art of weaving has made, considering its antiquity, singularly slow progress in its improvements. Beginning with the dawn of history and apparently simple as an art, there have been but four notable improvements in the loom to this day, of which this is the last, and, we are tempted to believe, the most noteworthy. Until 1785, when John Kay, of Bury, England, devised the "flying shuttle," and was driven out of the realm to die in poverty by the men who were benefited by his invention, the art and the loom remained substantially as they were from the earliest times.

His contrivance reduced the requisite amount of labor, to produce a given amount of work, fifty per cent. of what it had been up to his time. It was the first step taken in the direction of labor-saving in this art. In this line, Dr. Arkwright's "power loom," which was the mechanical application of power other than that of the weaver to driving the loom, naturally followed—a great invention and prominent among the four. Power, as applied to machinery, implies not only labor-saving, but admits of elaborate workmanship, together with other advantages not necessary to enumerate.

In 1801 Joseph Jacquard invented the machine which bears his name, for mechanically weaving irregular patterns and designs. Like that of Arkwright, it has not been materially improved upon, remaining substantially as it left his hand, and marked an era. Thus, after centuries of mere repetition and a most limited application of the weaver's art, we find a movement started, an innovation toward devices for saving labor, or, properly speaking, the production of greater quantities with the same amount of labor. And though opinions differ, it seems to us that the quality and variety as well as the quantity of the product must of necessity be superior when made by machinery instead of by hand.

John Kay and Joseph Jacquard were both mobbed. Arkwright and Lyall were fortunate in belonging to a more enlightened age, whose inventors are acknowledged as benefactors.

Improvement in any art, machine, or process, almost always shortly requires a corresponding advance in respect to something which had been neglected and left behind in the march, and which now imperatively requires to be brought up to the same standard of excellence.

So it was in this instance. It soon became apparent that passing the shuttle through the shed of warps by means of the "picking sticks" ("the flying shuttle") in a power loom was surrounded with many and great disadvantages; for reasons we will explain hereafter.

Indeed, the shuttle movement has always been considered the least perfect part of the machine, and especially was this true after the application of power. Since Arkwright, inventors have been at work trying to solve the problem, and innumerable attempts have been made to bring the shuttle movement up to a level with the mechanical efficiency of the rest of the parts, and until now without success. The "picking sticks" of Kay continued to hold their ground until this invention supplanted them.

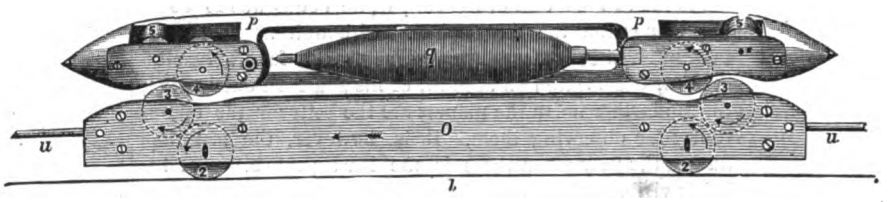


Fig. 1.—SHUTTLE AND CARRIAGE.

It was a simple contrivance, and in its day valuable. Briefly, instead of the shuttle being thrown through by one hand of the operative and caught in the other, it was projected through by a blow of the picking stick, and sent back again by a blow from the other one. Not here to dwell upon the disadvantages of this contrivance, the problem was how to pass the shuttle through the sheds of warp by an action always under control, by an actuation which should be uniform and constant, not intermittent. The difficulty was, that when to accomplish this the shuttle was permanently attached to the actuating parts of the machine, the sheds of warp, in changing position alternately from above and below, would weave this attachment along with the weft into the fabric.

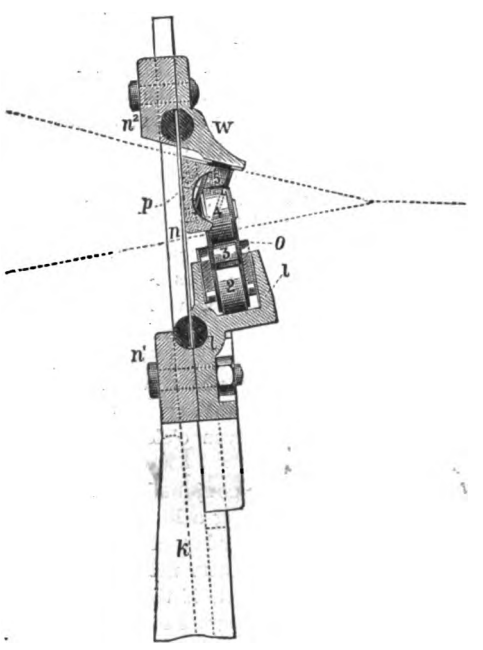


Fig. 2.—SECTION OF LAY, REED, AND RACEWAY.

It reminds one of the trials of the Chinese to make a barrel with two heads. They could easily make one with one head, but when it came to setting the other head they had to put a man inside to assist the workman on the outside, and so when the barrel was finished, there was a man inside it. It was many years before they could deliver a complete barrel without a man in.

Innumerable attempts have been made. One was known as the "compressed air" shuttle motion, which was designed to project the shuttle back and forth by the force of atmospheric elasticity; another was by means of quickly revolving rollers which caught the shuttle and expelled it from a sort of shuttle box; "clutch sticks" to pull it through, and magnets, have been tried, all without practical success. It seemed for years as though an insurmountable mechanical obstacle presented itself in the way of obtaining a positive motion, and so it remained until this invention.

It has been accomplished by means at once simple and reliable, admitting of no uncertainty of movement, and fills all the conditions required of it.

Fig. 1 is a side elevation of the shuttle and carriage. Fig. 2 is a section of lay, reed, and raceway, with an end view of shuttle and carriage. Referring to Fig. 1, the carriage, O, rests on the track, *l*, inside the raceway (not shown), the sides of which are even with the top of the carriage. Immediately over the top of both carriage and raceway, at right angles to them, is stretched the lower shed of warp, passing through the open space between the carriage and the shuttle, *pp*. The carriage propelled by the band, *uu*, in either direction, moves across under the shed of warps, while the shuttle resting on the carriage moves with it over the shed of warps. To prevent the shuttle jumping off its carriage, it is held down by the rollers, 5, 5, which play against a track above, W, shown in Fig. 2, passing along the under side of the upper shed of warps. This prevents it rising sufficiently to permit roller 4 to pass over roller 3, and escape from the carriage. The inclosed position of the rollers 4, 4, between rollers 3, 3, imparts the motion of the carriage to the shuttle, while the play allowed, amounting to something more than the thickness of a thread of warp, admits of the warp passing through where the rollers are in contact. The revolution of the rollers as indicated by the arrows, which motion is derived from the track, facilitates the passage of warp between them as the carriage moves forward. Friction is thus almost entirely removed.

The mechanism may not be inaptly illustrated by the circus-rider standing on the back of his horse, and leaping over the ribbons as his horse runs. The horse represents the carriage, the ribbons the lower shed of warp, while the weight of the man really represents the upper rail keeping him down. The rider is the shuttle passing over the warp, while the horse, without absolute connection, carries him forward. The purchase which the shuttle gets from the carriage is the same, mathematically, which the man gets from the horse.

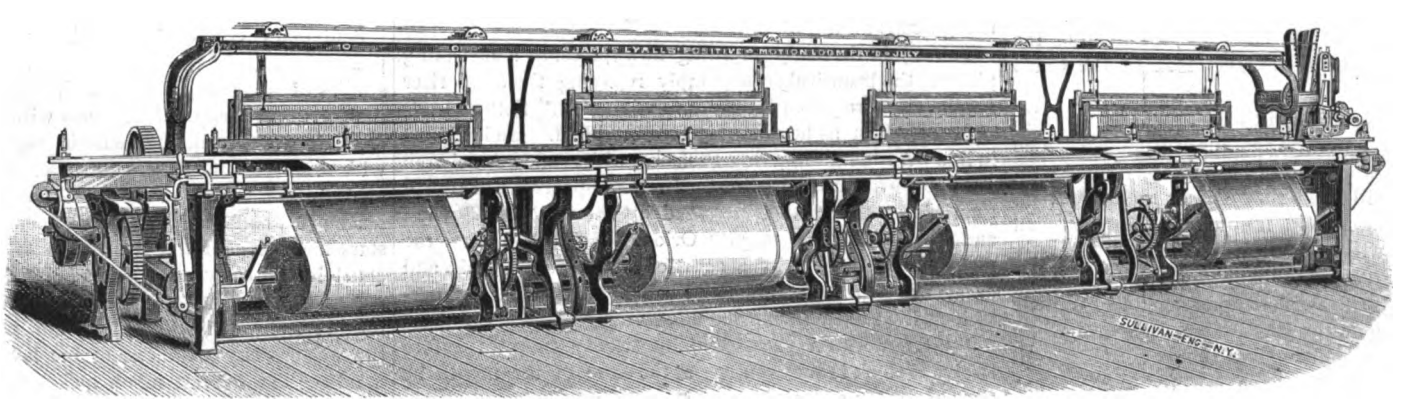
To enumerate some of the defects of the picking-staff shuttle will be equivalent to describing the merits of the Lyall machine, for it absolutely removes the objectionable features of the former, and has in fact supplanted it. The friction of the fly-shuttle on the warp is sufficient to materially injure the threads and cause them to break. This is also frequently the consequence of the uncertain and unguided direction of the "projectile," as it has properly been called, plunging into the warp and snapping the threads. The irregular indentation of the leather due to the constant hammering often gives a wrong inclination, causing the shuttle to be deflected from its mark, and it goes anywhere at random.

Its eccentric conduct can frequently not be accounted for or remedied for days, and the weavers say it has the devil in it. Sometimes the blow is not strong enough, and it stops short of the requisite distance; and, again, too strong, when it recoils from the opposite pick. This results in an irregular tension on the weft and a consequent defective selvage and irregularity in the texture. It must be borne in mind that every breakage costs time, which is money, and more money for repairs, as well as every defect or irregularity in the goods costs in the reduction of market price.

However useful in its day, it is now anomalous that the most essential movement of a machine should be almost entirely independent and out of control in its action, while the other parts go on with the reliability of mechanism. Consequently, if it stops midway in the loom, the other parts move on, and then comes a "smash" and consequent suspension of work and expense.

It is a wayward sort of thing, and we need enumerate its short-comings only so far as to say that it is irregular in its motion and violent in its action. Sudden and violent mechanical movements have always been abandoned in all classes of machinery so soon as a more regular and positive means has been discovered which would perform even an equivalent of duty.

Let us now consider the positive merits of the positive motion loom. As a rule, substituting machine work for human skill secures a more perfect product. The machine does not tire nor lapse, and the fabric is more uniform than the best handcraft could make it. These advantages are all here secured. But the enormous strides they have made, and are



THE LYALL POSITIVE MOTION FOUR WEB LOOM.

still making, in improving the loom and its products, can only be properly comprehended by personally inspecting the works of the firm. No written description can more than suggest it. The saving of labor is apparent at a glance. One girl can now run ten looms, that is, two looms of five webs each, that is, the work of ten weavers, and on cloth of a width which formerly could not have been made on any loom in the world.

Indeed, the possible width is practically unlimited with a positive motion shuttle. The uniformity and steadiness of its action naturally produces uniformity and perfectness in the fabric.

It further admits of the use of a much larger "cop" of thread for the weft. And here, again, is a very great advantage. Every "stop," for the purpose of renewing the cop, involves a defect in the fabric, for it is impossible to start the machine with a new weft without, for one cause and another, the new thread being noticeable in the cloth.

Hence, the fewer the stops the fewer the defects in the cloth. This machine, carrying a cop six times as long as formerly was possible, calls for only one stop in six of what was formerly necessary. These two advantages, referring to quantity and quality, are alone sufficient to make the fame of any machine.

To understate it, the advantage secured is ten to one in quantity, and six to one in quality.

At the risk of repetition, we will conclude by briefly enumerating the advantages secured by it:

The striking feature of the loom is that the picking stick, heretofore of universal use, is entirely dispensed with. The shuttle being drawn through the warps, is, with all other parts of the machine, held, controlled and acted upon by a direct and continuous connection with the motive power; hence the liability of a "smash" is removed, and no injury can happen the reed. In case of the loom being stopped during the passage of the shuttle, or at any other time, each part is in place for starting again.

The advantages may be briefly enumerated:

1. The unlimited scope of the shuttle: it being drawn, instead of knocked, through the warps, enables the carrying of large quantities of weft any distance; which being kept at a uniform tension until it is beat gives a perfect selvage.

2. The friction of the shuttle on the yarn is perfectly overcome, therefore it does not wear the warps, nor break any threads, even in the finest fabrics of silk, wool, cotton or linen.

3. The weft is not subject to sudden pulls in starting, and may be of the most delicate texture, regardless of the width of the fabric.

4. The loom can easily be arranged to run a number of shuttles, weaving as many widths of cloth as there are shuttles, and with perfect selvage.

5. The width of the fabric may be extended indefinitely.

6. The loom runs with less power, much more quietly than others, and at any speed desirable.

7. The great desideratum is, that it dispenses with the necessity for the skilled labor heretofore required, enables the weaving of very wide goods at no greater cost per square yard than that of narrow, and on ordinary cotton and woolen fabrics gives a large gain.

The looms are now running in a number of the largest and most important mills in this country and giving great satisfaction, and for Jacquard irregular and heavy sleyed fabrics it is indispensable.

Their four-piece loom is arranged with head motion, for from 4 to 12 harnesses for weaving seamless bags, jeans, crash, toweling, ticking, duck, canvas, hose, etc. They build the above loom to weave from 2 to 5 webs in each loom up to 36 inches wide. Using the large cops or bobbins (which are 4 to 10 times larger than those used in other looms), a girl can run two looms 5 webs each, equal to 10 ordinary looms. It has positive take-up for a large roll of cloth 30 inches in diameter; wrought iron crank shaft, tension or friction let-off, geared for any number of picks per inch, and beam heads from 18 to 24 inches in diameter, and stop motion for each web; harness are also arranged to work from cams 2, 3 or 4 harnesses. These looms are used for sheetings, quilts and blankets, 2 webs in each loom, 80 to 100 inches wide, and are arranged for "Jacquard" when required. They also manufacture cop-winding, spool-winding and cop-compressing machines, of similar ingenuity and value.

Electrical Units.

The International Electrical Congress held in Paris decided to make use of the centimeter, gramme and second in all electrical measurements. They will retain the practical units, "ohm" for resistance, and "volt" for electromotive force. The *intensity* of a current produced by one volt, with a resistance of one ohm, will be called one "ampère;" and the quantity of electricity given by one ampère in one second will be called a "coulomb;" the term "farad" indicates the capacity of the condenser which, laden with a volt, holds one coulomb of electricity. The old term "weber," as unit of intensity of current, will not be used.

A LARGE STEEL CONTRACT.—The contract for supplying steel for the new bridge over the Frith of Forth, Scotland, calls for 45,000 tons. This is called one of the largest orders for steel for bridge building.

BREAK IN THE HUDSON RIVER TUNNEL.

An accident occurred at the New York end of the Hudson River Tunnel, Aug. 20, which may delay the work there for ten days or more.

Men were employed laying up the brick-work lining of a 15-foot section, the iron shell of which had been completed, when a plate of the temporary bulkhead gave way and

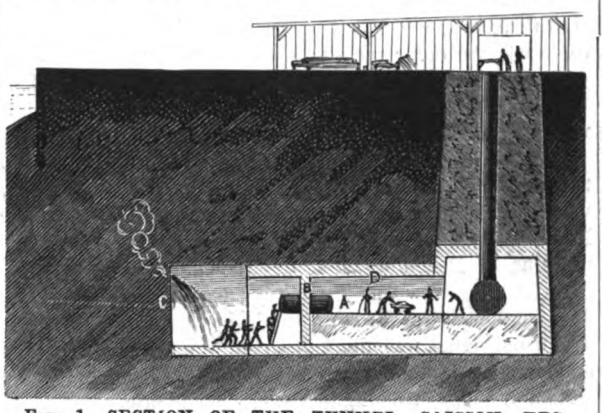


Fig. 1.—SECTION OF THE TUNNEL, CAISSON, ETC.

allowed the compressed air to escape and the water to rush in. The temporary bulkhead was 65 feet from the west side of the caisson and 20 feet in advance of the fixed bulkhead carrying the air-lock. The men had ample time to take refuge in the air-lock, and no one was hurt.

The process of working and the nature of the accident

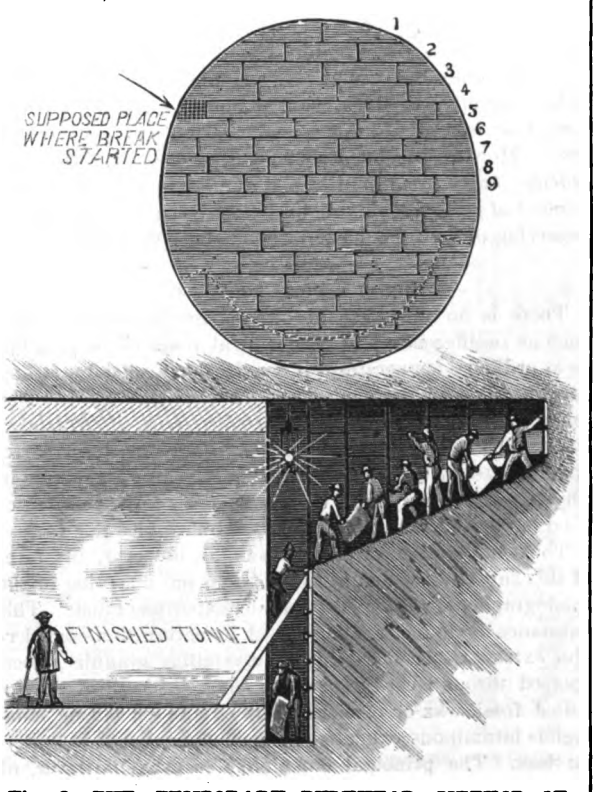


Fig. 2.—THE TEMPORARY BULKHEAD.—METHOD OF ADVANCING THE WORK.

will be clearly understood from the illustrations herewith. Owing to the loose character of the soil on this side of the river, special precautions have been taken to protect the workmen against accident, and the value of these precautions has now been amply demonstrated.

Fig. 1 shows the situation of affairs in the tunnel at the moment of the accident: B is the fixed bulkhead; A the air-lock; C the temporary bulkhead; D the finished portion of the tunnel.

The novel feature is the temporary bulkhead, a plan of which is shown in Fig. 2, the dark spot indicating the plate supposed to have first given way. This bulkhead is built up of eighteen courses of boiler plates, bolted together, and is alternately taken down and reconstructed from the top as the iron shell of the tunnel is advanced, and the earth removed. The method of proceeding is shown in Fig. 2.

The tunnel is advanced in sections of fifteen feet. A new section is entered upon by removing one of the topmost pair of plates of the forward bulkhead. The earth before it is dug out, and one plate of the iron shell of the tunnel is inserted. Then the second plate of the bulkhead is removed and a second plate of the shell is put in. The second course of bulkhead plates is then taken out plate by plate, the earth excavated, and the construction of the shell continued, both at the sides and in front, until the forward progress of the shell at the top has reached a distance of fifteen feet. Then the first course of a new bulkhead is inserted. After that, as fast as the earth is removed, the iron shell and the forward bulkhead are constructed simultaneously, until both are complete, substantially protecting the workmen against large or sudden escapes of air and inrushes of water. As the work goes on in each section, the air-pressure is gradually reduced. The highest pressure is 26½ pounds.

The iron shell of a fifteen-foot section had been completed, with the temporary bulkhead in place, two days before the accident. The bricklayers had built up the brick lining or inclosing wall of the new section of the tunnel as far as shown by the dotted lines of Fig. 2, when a hissing sound warned them of escaping air. As the air-pressure lessened water came in, and the workmen fled to the air-lock leading to the completed portion of the tunnel, closed the door, and were safe. The manner of their escape is shown in Fig. 3. It is supposed that by some neglect the marked plate in the fifth course of bulkhead plates, as shown in the plan, had been imperfectly bolted, and the defect precipitated the accident. The flooded portion of the tunnel has since been entered from the air-lock by a diver, who found the bottom of the broken section covered with sand and stones. The iron shell of the section, in front and on top, had been broken in several places, leaving considerable gaps. These breaks have been stopped by a filling of sawdust, sandbags, and other material, and the work of pumping out is now going on. New plates will be substituted for the broken ones, and the work will then go on as before.

It may be added that the New Jersey end of the tunnel is being advanced from twenty to twenty-five feet a week.

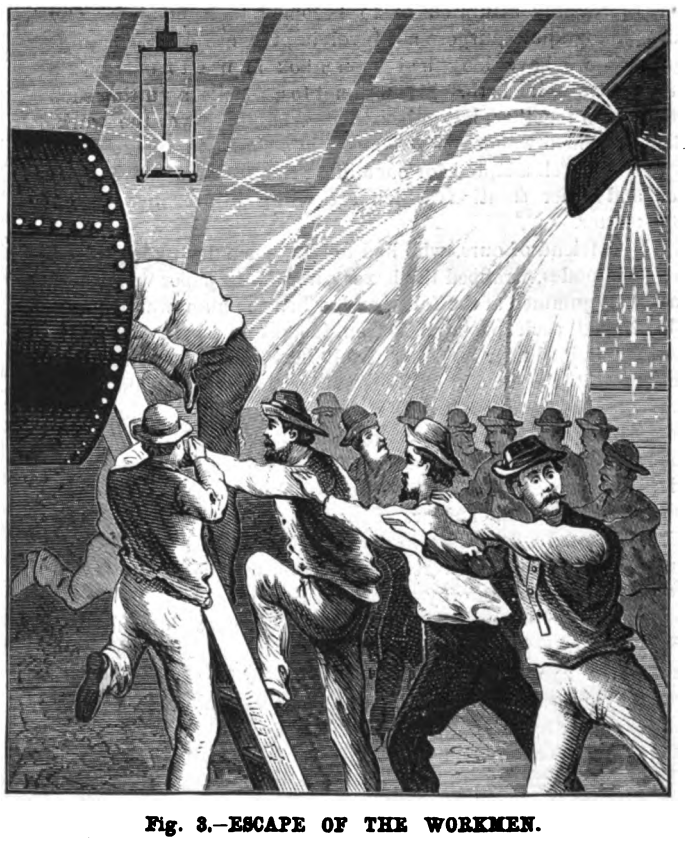


Fig. 3.—ESCAPE OF THE WORKMEN.

Earthquake in Mexico.

The severest earthquake felt in Mexico since 1864 was experienced July 19, at 2:35 P.M. The shock lasted two minutes and thirty seconds, making it one of the longest earthquakes on record. The *World's* correspondent at the City of Mexico says that the shock was felt at Cuernavaca, Iguala, Tlaxcala, Toluca, Puebla, Orizaba, Vera Cruz, Queretaro, Oaxaca, Cuautitlan, and Yautepec, so it is estimated that the shock extended over an area of 1,688 leagues.

In the capital it caused much mischief. The walls of several houses fell, a great many edifices were badly cracked, and the churches suffered greatly. In the Cathedral are several fissures in the principal vaults and a wide opening in the north wall near the entrance. The parochial church, El Sagrario, was very much cracked, as also those of San Fernando and San Salvador. In the National Palace and City Hall, and in the rooms occupied by the public archives, the walls are very badly cracked. The Mexican Railway Station also suffered. It is estimated that at least 80 per cent of the buildings in the city were more or less injured.

The water in the city fountains and that of Lake Texcoco overflowed in all directions. The earth opened in some places, and the ground sank in in others. The water pipes were broken and there was a great scarcity of water during the next forty-eight hours.

The monumental arches of the aqueduct of San Cosme and of the Salto del Agua suffered a great many fissures, from which the water flowed freely.

In Puebla nearly all the buildings were badly damaged. The inhabitants of Vera Cruz were fearfully alarmed; the shock was very strong there, and the sea roared furiously all the time. In the town of Yautepec the church and several houses fell. In Oaxaca it was accompanied by loud subterranean rumblings and caused much damage. The City of Huajuapam, in the State of Oaxaca, has nearly disappeared, as all the principal buildings, the churches, and the greater part of the private residences are in ruins; and in the thriving town of Huamantla, on the railway, very large rocks have fallen from that grand mountain, the "Malinche," causing great damage.

Fighting Field Fires with Steamers.

A threatening field fire which had been fought by a large part of the population of South Lewiston, Maine, without staying it, was subdued by a steam fire engine sent down from Lewiston. Three thousand feet of hose was used, water being taken from a brook. By saturating the mossy ground the fire was speedily stopped, though a large timbering had been burned over.

Railway Improvements Needed.

American railway practice has changed in many particulars since the last decade, and one of the results is that certain classes of accidents are more frequent than formerly. Some of these, as has been before mentioned in these columns, are the result of higher velocities and heavier trains. The increased weight of locomotives and train loads, with 20 and even 30 tons of paying load to the car, will scarcely call for any new inventions. All that is required on that account is stronger bridges and permanent way and fixtures.

But the higher velocities increase the number of collisions, and here is work for the inventor. The number of collisions of passenger trains have not increased in proportion to the increase in speed, for the reason that atmospheric and other brakes were opportunely invented; but as these brakes were not adapted to freight cars, collisions between freight and passenger and freight trains are on the increase.

The "butting" collisions average about twelve per month. Some of these are caused by bad management or disobedience of orders, and some by reason of the trains not being under control of the train men. This latter evil can be remedied by the use of a new style of brake, or perhaps the improvement of some that are now in use. "Rear" collisions are at the rate of twenty-five to forty per month, and from five to seven of these are caused by trains breaking in two, and the detached cars being in the way of trains following closely. These accidents may be prevented by safety-couplings when they are brought out. The remaining portions of these collisions, or many of them, may be avoided by obedience to orders and a better system of signals than is now in general use. We also have from one to three crossing collisions per month. The only *sure way* to prevent these disasters is for *all trains to stop* within, say, one hundred feet of the crossing, but as this rule will not be established or enforced on all roads, inventors are called upon to produce an *effective* signal for crossings.

Then we have from sixty-five to eighty derailments monthly. Many of these are caused by defect or failure of track or equipment, but from sixteen to thirty of these accidents are unexplained, that is, no cause can be assigned. Many of these derailments are of a serious nature, by reason of the locomotive and cars being upset, and here is where the inventor is wanted.

It is not expected that anything will be produced that will prevent wheels occasionally leaving the track, but something can be contrived that will act as a guard to prevent trucks straying down embankments and overturning.

The check chains in common use are a partial protection, but they are either too light to stand the shock, and break, or pull out their fastenings. It would seem that a kind of "shoe" or "runner" might be so arranged that, when the wheels drop from the rail, the runner would catch the rail and keep the wheels in line and close to the rail, and also act as a brake by friction on the rails, thereby preventing serious accidents. Something of the kind was brought out years ago, but it was poorly contrived and did not come into use. This is a matter well worth the attention of inventors.

Another class of accidents that is becoming quite frequent is "runaway locomotives." In May, of this year, three collisions and one derailment were caused by "runaways." A locomotive is standing on the track with steam up and no one aboard of her. Some car or engine collides with her and gives her a slight shock which opens the throttle, and away she goes, destroying life and property. Of course there are thumb screws and other devices for securing throttles, but they are neglected, and the results are frequently serious. What is wanted is an automatic locking arrangement that will secure the throttle when closed, and at the same time not interfere with rapid handling when doing yard work or switching.

Accidents from brake beams falling on the track are becoming quite frequent, and an improvement in the manner of hanging brakes is in order. Several accidents occur every month, except in the winter, caused by cattle on the track, the barbed wire fence being an insufficient barrier to keep them off. We want an improved pilot, one that will throw live stock to one side, and not roll them under the wheels, and the trains in the ditch.

In these sweltering days it may be refreshing to consider the fact, that snow and ice cause from twenty-five to forty serious derailments and numerous collisions every ordinary winter in the United States. We can hardly expect inventors will produce anything that will prevent collisions in time of snow blockades or blinding snow storms, but there is yet room for improvement in machinery for clearing snow and ice from railway tracks. One of the most important items connected with this work is keeping the flange-ways clear. If these are kept clear of hard snow and ice, locomotives have good footing (so to speak), and can force the big plows through almost any depth of snow. What is wanted is scrapers attached to the front of locomotive truck wheels, so that the flange-ways may be kept clear at all times. It is not forgotten that several devices for the purpose are in use, but the best of them are far from being perfect. Derailments frequently occur on roads using the best appliances for clearing tracks, by reason of packed snow or ice. Even the monster plows are often derailed, and all the rolling stock behind it. In severe winters the expense of clearing tracks is enormous, as much of it is done with pick and shovel, and the inventor who will reduce this expense will be rewarded therefor.

The open draw still continues to swallow victims from time to time, notwithstanding all that has been done to prevent these horrors. Within the last nine years twenty-eight of these accidents have been reported by the *Railroad Gazette*, and in some instances the draws were provided with the most approved signals in use. Let us have something better—an audible signal that can be relied on. In April last a freight train ran into an open draw at Peekskill, N. Y. The usual signals were displayed, but were not noticed. Had there been gongs or torpedoes placed at intervals along the track, the outer one a thousand feet or more from the draw, the engineer would have been forcibly reminded of his immediate danger, and a few dollars' worth of signals would have saved thousands of dollars' worth of property.

An occurrence similar to the above was what happened to the pay-train on the Chicago and Northwestern Road, which went through the open draw of the bridge over the North Branch of the Chicago River, in Chicago, on the morning of December 21 last. The engine went into the river, but the draw was just closing and stopped the pay-car. The conductor was drowned and the engineer badly hurt. The usual signal was displayed, but was obscured by fog and smoke. Instances are not wanting to prove that no system of signals trusting to vision alone is safe.

Even when they are not obscured by smoke or fog, and are plainly visible, engineers are liable to get confused and mistake the danger for the safety signal, as has happened on many occasions. An automatic audible signal should be placed far enough from the draw to give ample time to stop, and one placed at intervals up to the draw, for the reason that the draw might be opened after the train passed the distant signal which was at safety, and gave no warning of dangers. It is hardly worth while to mention the fact, that we have an average of seventeen locomotive boiler explosions per annum, for inventors can do but little to prevent this class of accidents under the reckless management the boilers too often receive. Similar remarks will apply to the forty-four failures of bridges and trestles that occurred in 1881. However, if inventors cannot prevent all of these accidents, if they can diminish their number by some improved method of strengthening boilers and bridges, they will be deserving of both thanks and liberal compensation.

Some Uses of Paraffin.

There is no substance of organic origin which displays such an indifference toward chemical reagents as paraffin, as at ordinary temperatures it is quite unaffected by strong nitric acid, sulphuric acid, or chlorine. Paraffin is a name applied by chemists to an extensive series of hydrocarbons, each one possessing a chemical composition corresponding to the general formula C_nH_{n2+2}, and ranging in physical condition from the gaseous state to the harder kind of paraffin wax, which melts at about 140° F.

The solid paraffin, or paraffin-wax, is, however, the form of this substance which is likely to do most service to the photographer or the photographic experimentalist. This substance is found ready formed in nature to a considerable extent, either occurring as crystalline granules, interspersed through earthy matters, as in the case of the so-called fossil wax or ozokerit; while Rangoon tar and analogous bituminous exudations contain abundance of paraffin wax. The principal commercial source, however, of solid paraffin is mineral ore, the distillate being subsequently fractionated, and the heavy portions refined by treatment with sulphuric acid and crystallization from exceedingly light paraffin or benzoline oil.

The best qualities of commercial paraffin wax melt at about 140° F., and consist principally of a hydrocarbon containing $C_{30}H_{62}$, and such a product is excellently well adapted as a waterproofing material for wood-work, paper, and textile fabrics, as no trace of oily exudation tends to separate from it. A well-made wooden box, if soaked for half an hour in such paraffin heated to about 300° F., becomes so thoroughly saturated as to become a tank fitted for any photographic purpose not involving the use of hot liquids, and we have long had such a box in use to contain an electrotyping bath. It is well not to use nails in putting such a bath together, but either to dovetail or dowel the work. Paraffined wooden boxes made in a similar way are excellently well adapted for containing the nitrate of silver bath and other solutions which are easily injured by foreign matter.

A friend of ours, who had to send some dry plates to the Antipodes, wrapped the boxes carefully in paper which was well gummed at the folds, and, when the gum was dry, he dipped each package for an instant in a bath of paraffin maintained near its point of solidification. The plates thus protected arrived in better condition than others which were wrapped in lead-foil. This reminds us of the way in which ingots of sodium are sent into the market. Each ingot is dipped into melted paraffin wax, and this so far protects the metal from oxidation that the coated ingots may be kept in an ordinary tin canister. Something of the same kind was attempted a few years ago with joints of meat; but it was found that the covering of paraffin was liable to become broken during the voyage from Australia.

The use of paraffin as a substitute for wax in rendering prints transparent was referred to in our columns some weeks ago, and our readers were cautioned against employing samples containing oily or viscous constituents. We have found that paraffin may replace white wax in the so-called encaustic paste used for facing albumen prints, and it is quite possible that it may prove a more effectual protective against damp than ordinary beeswax.

Stenhouse's method of waterproofing paper, cloth, and other textile fabrics with paraffin is of great practical value, and, as Dr. Nicol pointed out in our Year Book for 1876, admirable temporary dishes may be made from paraffined paper, the edges of the sheet being folded up, or kept in position either by pins or a light frame of wood. Dr. Nicol also mentions that friction with paraffin wax is an excellent preliminary to coating a plate with collodion for the wet process. The plate is warmed so as to be a few degrees above the melting point of paraffin, after which it is rubbed over with a lump of the solid material, and the excess is polished off with a warm flannel. We have tried this, and found it to yield excellent results, the collodion adhering well during the development and washing; but when dry it can readily be stripped from the glass should a reversed negative be desired. The paraffin forms a chemically clean substratum, and covers up many impurities on the plate, rendering these impurities harmless. Paraffin has one decided advantage over albumen as a substratum; namely, that of not working the slightest mischief to the nitrate of silver bath.

Instead of employing a lump of solid paraffin and warming the glass, a twenty-grain solution in benzole may be used, this being merely poured on the cold plate, and all excess polished off, as in the previous case.—*Photo. News.*

Curious Habits of Ants.

Sir John Lubbock's extraordinary book on "Ants, Bees, and Wasps" will amaze readers. Fancy ants having slaves! Fancy these proverbial examples to the sluggard keeping certain insects as we keep cows, and building sheds over them, and keeping others as pets! The aristocracy of ants seem to have all the vices which brought antique monarchies to destruction. Sir John writes soberly, as a philosopher should, and weighs his words no doubt, which makes his conclusions the more astonishing. The author quotes some of Huber's experiments, the value of which he has himself tested. The bloated ant aristocrats, it is said, "have lost the greater part of their instincts; their art, that is, the power of building; their domestic habits, for they show no care for their young, all this being done by the slaves; their industry, for they take no part in providing the daily supplies; if the colony changes the situation of its nest, the masters are all carried by the slaves on their backs to the new one; nay, they have even lost the habit of feeding. Huber placed thirty of them with some larvæ and pupæ and a supply of honey in a box. 'At first,' he says, 'they appeared to pay some little attention to the larvæ; they carried them here and there, but presently replaced them. More than one-half of the Amazons died of hunger in less than two days. They had not even traced out a dwelling; and the few ants still in existence were languid and without strength. I commiserated their condition, and gave them one of their black companions. This individual, unassisted, established order, formed a chamber in the earth, gathered together the larvæ, extricated several young ants that were ready to quit the condition of pupæ, and preserved the life of the remaining Amazons.' This observation has been fully confirmed by other naturalists. However small the prison, however large the quantity of food, these stupid creatures will starve in the midst of plenty rather than feed themselves. . . . I have, however, kept isolated specimens for three months by giving them a slave for an hour or two a day to clean and feed them; under these circumstances they remained in perfect health, while, but for the slaves, they would have perished in two or three days."

Some Large Lenses.

The thirty-inch objective for the great telescope of the Russian Observatory at Pulkova was lately tested at the establishment of the grinders, the Clarks, of Cambridgeport, Mass., and found to be fairly perfect. The flaw discovered before the grinding, due to imperfect cooling, has no effect on the definition, but lessens slightly the amount of light transmitted. The flaw is too slight to injure materially the efficiency of the lens, yet another block of glass, of the same size, has been ordered to be placed at the disposal of Professor Struve. For testing, the lens is mounted in a temporary telescope, forty-five feet long, and weighing, with its fittings, about seven tons. The lens weighs 450 pounds, will cost when finished $60,000, and will be for a little while the largest in the world.

The largest object-glass in use is the 26-inch lens at Washington, with a focal length of 33 feet. Its light-gathering power is 16,000 times that of the unaided eye.

The Pulkova glass will soon be excelled by that of the Lick telescope, the disk of glass for which is now in the establishment of the Clarks. It is 38 inches in diameter and 2 inches thick. When ground and polished it will be reduced to 36 inches. This glass is optically perfect. It was cast at Paris, France, where the Pulkova glass was, and weighs a little over 374 pounds. The casting occupied four days and the cooling thirty days.

A Large Tunnel.

The famous antique tunnel of Posilipo has a rival in a railway tunnel under Posilipo, between Naples and Puteoli, completed August 5. The new tunnel which brings into direct connection the modern representatives of the ancient cities of Neapolis and Puteoli, is over 30 feet wide by 36 feet high, and is said to be the largest modern tunnel in Europe.

Correspondence.

Intermittent Vision.

To the Editor of the Scientific American:

The method of viewing animals in rapid motion, which is suggested by Mr. S. H. Brackett, is, doubtless, quite satisfactory, but it implies a greater amount of rapid motion on the part of the observer than is necessary. All that is wanted is intermittent vision; and this can be accomplished in a variety of ways. Instead of opening a shutter repeatedly by rapid motion of the fingers while looking through a tube, it will be found more convenient to look through an opening in a disk of cardboard, which is at the same time kept revolving. This may be controlled by clockwork (see Ritchie's "Catalogue of School Apparatus," No. 733); or, more cheaply, though less conveniently, as shown in Prof. A. M. Mayer's little book on "Sound," page 111—a book which every teacher of natural science in our country possesses, or is sure to possess as soon as possible after seeing it.

An advantage of this apparatus is, that the number of views per second which the observer secures is controllable, and the repetitions are quite regular. It is possible to dispense with tubes, so that the moving animal is more easily followed with the eyes. Moreover, by adjusting the disk in position so that the observer's interocular line is parallel to its plane and perpendicular to its radius, the opening passes so quickly before the two eyes in succession as to afford binocular rather than monocular vision.

The writer has employed this method quite satisfactorily in studying the forms of falling drops of liquid. He claims, of course, no originality in this, for the instrument has long been known under the name of the stroboscope.

W. LE CONTE STEVENS.

40 West 40th street, New York, August 16, 1882.

Drying Gelatine Plates.

J. J. S. Bird says, in a communication to the Bristol and West of England Amateur Photographic Association: An inconvenience which has caused no little trouble to workers with gelatine plates is the length of time they take to dry. A collodion plate can be held to the fire and dried in a very short time; but a gelatine plate under the same conditions would melt and run. Now, a gelatine plate may, under different conditions, be dried quite as rapidly as a collodion plate; and I have frequently taken a negative, dried it, and printed a proof in considerably less than half an hour.

The principle is simply to remove the superfluous moisture before holding the negative to the fire, and this can be done by applying a piece of perfectly clean blotting-paper to the surface of the gelatine, using at first a moderate pressure, and increasing this pressure to any degree required. The blotting-paper will in *no way* injure the negative, and any stray pieces of fluff will dust off when the plate is dry. Still, it is better to carefully dust the blotting-paper and to remove any stray pieces of material before it is applied. It will now be found that the negative can be dried at any degree of heat in the space of from thirty seconds to two minutes. This fact led the writer to the following:

If a gelatine negative be dried as above, at only a moderate heat, it will not perceptibly differ from a negative which has been allowed to dry spontaneously; but if a negative from which the superfluous moisture has been extracted by blotting-paper be exposed to a greater heat the whole complexion of the negative is altered. Not only does the film become horny and tough, but the picture on it appears in *relief*—so much so that it seems to me quite possible to produce a cast from the negative capable of being printed from in an ordinary press. This is an extension of the principle referred to in this year's annuals, in which hot water is used as a *developer;* but this does not seem either as simple or efficacious as the method I suggest above. At all events, I think the matter is worthy of the consideration of the Society, and I commend the hints to my fellow-members.—*Brit. Jour. of Phot.*

The Electric Light as a Moth Catcher.

Dr. I. E. Nagle, of Vicksburg, Miss, suggests the use of uncovered electric lights for killing the moths, *Aletia*, from whose eggs the destructive cotton worm is hatched. He believes that a few lamps properly placed would attract and destroy the moths, so as to protect a wide belt of cotton country. The plan would be well worth trying wherever electric lamps are in use. In some parts of the South planters have found that brush fires or burning rubbish will attract the moths in swarms; and every female moth promptly killed prevents the birth of many worms. Whether electric lamps would prove more efficient or economical, only trial can determine.

Bursting of a Ship by Swelling of Cargo.

The *Gazette Maritime et Commerciale*, in its news regarding ocean disasters, relates the following curious example of the formidable power of molecular forces. The Italian ship Francesca, loaded with rice, put into port on May 11, at East London, leaking considerably. A large force of men was at once put on board to pump out the water contained in the ship and to unload her; but, in spite of all the activity exerted, the bags of rice soaked in water gradually, and swelled up. Two days afterward, on May 13, the ship was violently burst asunder by this swelling of her cargo.—*La Nature.*

The Performance of American Locomotives.

At the recent American Master Mechanics' Association convention at Niagara Falls, the following interesting paper was presented by Dr. P. H. Dudley:

The practical performance of the American fast express locomotive of to-day far exceeds what was thought possible ten years since, and we know from experience that the improvements you are constantly making will increase its speed for heavy trains.

If the data in regard to fast ten and twelve car trains were all collected it would leave no doubt as to the ability to run them fifty miles per hour, on nearly level roads, or five and six cars at sixty miles.

Having drawn with my dynagraph car fast express trains upon various roads, I present a brief tabulation of part of a trip, showing the performance of an ordinary locomotive upon a train composed of three 8-wheel and six 12-wheel cars; weight, 250 tons; total weight of locomotive ready for the start, 126,000 pounds, distributed as follows: Tender, 54,000 pounds; engine, 72,000 pounds; 48.000 pounds being upon the drivers, which were six feet in diameter; cylinders, 17x24; steam-pressure gauge set at 135 pounds.

The first column shows the number of miles; the second, the time of run in minutes and seconds; the third, speed in miles per hour; the fourth, velocity of the wind in miles per hour; the fifth, approximate grades; the sixth, foot pounds of work, shown by the dynametrical curve, in drawing the cars per mile.

The seventh, foot pounds per minute expressed in horse-power.

The eighth, approximate calculated foot pounds of work required to move the locomotive itself, expressed in horse-power.

The ninth, the sum of columns seventh and eighth.

Column eight will vary with every locomotive, and could only be determined by direct experiment.

Number of miles.	Time in minutes and seconds per mile.	Speed in miles per hour.	Velocity of the wind in miles per hour.	Approximate grades.	Foot lb. of work shown by dynametrical curve per mile.	Foot lb. of work per minute expressed in horse-power.	Approximate calculated foot lb. of work required to move the locomotive in horse-pr.	Sum of Columns 7 and 8.
1	2:54	20·68	.....	Level	24,116,233	252	....	.....
				Down				
2	1:34	38·31	6	5·3	20,035,253	369	221	590
				Down				
3	1:22	43·90	4	5·3	17,763,214	398	292	690
4	1:16	47·34	8	Level	15,904,273	393	418	791
5	1:11	50·70	4·5	Level	14,871,528	382	406	788
				Up				
6	1:13	49·31	6	13 feet	15,284,616	388	406	789
				Down				
7	1:11	50·70	6	18 feet	14,458,480	369	426	795
				Down				
8	1:08	52·89	5	13 feet	13,219,136	354	451	805
				Down				
9	1:07	53·70	5	8 feet	11,566,744	319	483	802
				Down				
10	1:09	52·10	5	5 feet	11,773,293	310	441	751
11	1:08	52·89	4·2	Level	11,773,293	316	447	763
				Down				
12	1:09	52·10	5·2	8 feet	12,806,083	337	456	793
13	1:10	51·43	6	Level	12.392,940	324	443	767
14	1:10	51·43	4·5	Level	12,8 6,038	339	426	765
15	1:10	51·43	4	Level	13,425,685	351	420	771
16	1:10	51·43	3·5	Level	13.299.186	345	415	760
17	1:08	52·89	3	Level	13,838,783	371	443	814
				Down				
18	1:08	52.89	5	6 feet	13,219,136	354	464	818
				Down				
19	1:08	52·89	3	2 feet	13,219,136	354	443	797
				Up				
20	1:11	50·70	3·5	10 feet	14,838,783	379	406	785
				Up				
21	1:13	49·31	3	10 feet	14,458,480	362	384	746
22	1:08	52·89	3·1	Level	12,392,940	332	443	775
			3·1	Down				
23	1:07	53·70		10 feet	12,186,391	338	462	797

In starting the train the locomotive would record a tension of 11,000 to 12,000 pounds for 100 or 200 feet of distance, then by hooking up the cut-off and other causes would reduce to 2,800 to 3,000 pounds when the speed of 50 miles per hour was attained in the fifth mile. As the speed increases the resistance of the air against the locomotive becomes greater, and more of its own power is required to move itself, and less can be used to draw the cars. The increased foot pounds of work in the first four miles show less than one-half of that required to overcome the inertia of the train for the speed of 50 miles per hour. Inertia is an important element of train resistance, especially on local trains, as it limits the speed for short runs and must be considered in choice of locomotive for the service. In starting a train the working adhesion of the steel-tired drivers, on dry steel rail, is usually above 33 per cent. of the weight upon them, and reduces as the speed increases, but in what ratio, not ascertained by experiment; 18 to 20 per cent has been obtained at 56 miles per hour, the percentage of slip not exceeding 1½ per cent.

The great and substantial improvement in the permanent way, of late years, permits a higher percentage of adhesion than formerly.

One of the most important features shown in the tabulations is the quick steam-generating capacity of the boiler; 800, 900, or 1,000 horse-power developed in the brief time of one minute may be expressed in figures, but the mind fails to gain any adequate conception of the enormous power. At 135 pounds steam pressure, 300 or 338 pounds of water will be evaporated per minute with a consumption of 40 or 50 pounds of coal; this requires a very rapid generation of heat and its quick absorption by the water.

Owing to the large amount of heat which is absorbed by the water before it makes any pressure of steam, a less proportion of heat units is required to do the work at high pressures than low, therefore the rate of transmission per minute will be less for the heating surfaces.

The Swiss and German locomotives are reported to carry from 165 to 180 pounds pressure as a rule, with exceptional ones at 225.

In drawing fast and heavy trains on various roads, the greatest difficulty in making time has been want of steam. There are so many contingencies which may daily arise of winds, storms, etc, that provision must be made for a greater capacity than is required for ordinary occasions. In observing what the train resistance would be for the above-mentioned train, about 11 pounds per ton, it must not be concluded that this would also be true of any other weight of train; the resistance of the same number and class of cars increases in same ratio as the speed increases, and as we increase the tonnage number of cars the amount per ton decreases.

Another important element of train resistance is the condition of the track. Having upon my instrument apparatus for mechanically determining the condition of the track, it is found, even on the best roads, each mile cannot be in equal condition, owing to increased wear and quality of rail. On grades is this especially the case, and at stations where many trains stop and start. Experiments upon all classes of passenger trains are too limited to give any reliable formulas for general use. For long and heavy trains I have found the resistance per ton much less than that given by the latest formulas.

Preparations for Observing the Transit of Venus.

Work has been begun by the commission created by Congress to determine the methods to be employed in observing the transit of Venus, and to take the preconcerted observations next December. The commission is composed of Vice-Admiral Rowan, Superintendent of Naval Observatory; Professor O. C. Marsh, President of the National Academy of Sciences; Professor Hilgard, Superintendent of the Coast Survey; Professor Newcomb, Superintendent of the Nautical Almanac; and Professor Hall, of the National Observatory. Washington, D. C., will be the most northern station, and will be in charge of Professor William Harkness. The other United States stations within our own territory will be at Cedar Keys, Fla., in charge of Professor John R. Eastman; San Antonio, Texas, in charge of Professor Asaph Hall; and Fort Thorne, New Mexico, in charge of Professor George Davidson. The foreign stations in charge of Americans will be at Cape of Good Hope, Professor Newcomb, assisted by Lieutenant Casey; Santa Cruz, Patagonia, Mr. O. B. Wheeler, late of the Lake Survey, assisted by Mr. Wm. Bell and Mr. Irvin Stanley, photographers; Santiago, Chili, Professor Lewis Boss, of Dudley Observatory, Albany, assisted by Mr. Rock, of the Naval Observatory; and a New Zealand station, in charge of Mr. Edwin Smith, late of the Coast Survey, who will be assisted by Professor Pritchett, of Washington University, St. Louis.

All the foreign parties will set out before the middle of September; those for home stations not before the middle of October.

A Monster Flagstone.

An immense flagstone, which is said to be the largest ever quarried in America, and is destined for the sidewalk in front of R. L. Stuart's new brownstone residence at Fifth Avenue and Sixty-eighth street, stretched across the avenue from curb to curb yesterday, and made it necessary to close the street between Sixty-eighth and Sixty-ninth streets. The great slab is of river bluestone, and measures 26 feet and 6 inches by 15 feet and 6 inches. It is 9 inches thick, and weighs over 30 tons. If raised on edge it would make one side of an average seashore cottage. It is perfectly smooth, with the exception of a slight ridge through the center, which will be removed after it is in position. The stone was cut from the same quarry in Sullivan county as the great flagstone now composing part of the sidewalk in front of the Vanderbilt mansion, but it is much larger. It was brought down the Hudson from the quarry on the deck of a barge, and unloaded at the foot of Fourteenth street by being raised high enough with "screw jacks" for two heavy flat stone wagons to be placed under it, when it was drawn to its destination by eighteen powerful horses.

An Index to Public Documents.

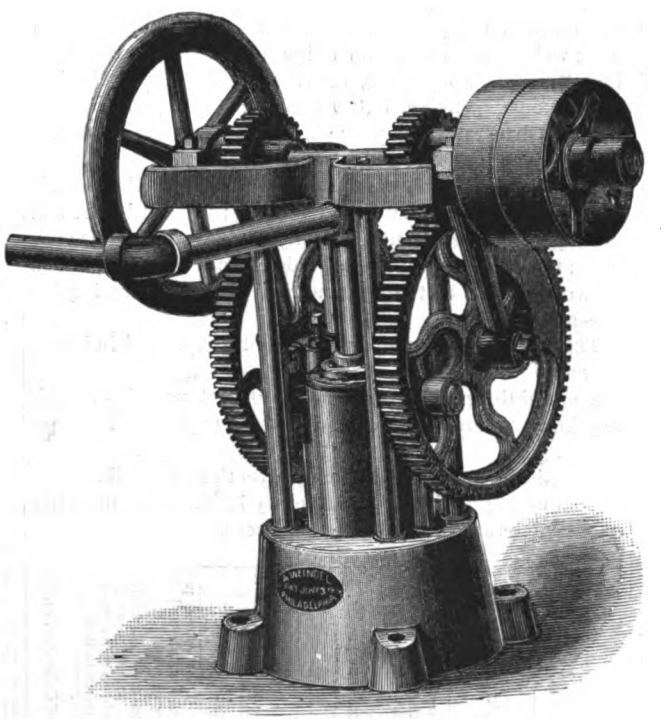
The vast amount of valuable information buried in public documents is to be made accessible by means of a classified, analytical, and descriptive catalogue of all government publications, from the foundation of the government to the present time. At the last session Congress provided an appropriation of $10,000 for the work, which will be done under the direction of Major Ben. Perley Poore.

IN our description of the horse power hoisting machinery made by the Contractors' Plant Manufacturing Company, 296 Exchange Street, Buffalo, N. Y. (issue of August 12), the titles to Figs. 2 and 3 of the engravings were in some way transposed. Fig. 2 is a horse power for miners and builders, and Fig. 3 is the horse power for contractors. These machines, although similar in appearance, are somewhat different in their proportions. We learn from the manufacturers of these machines that they are being rapidly introduced, and are everywhere giving excellent satisfaction.

GEARED PENDULUM AIR PUMP.

The loss of power in the use of a fan or blower is acknowledged to be very great, even at small pressures; and as soon as a larger pressure, say 1¼ pounds to the square inch, is desired, these kinds of machines will be found wanting, no matter how large a size should be procured. But there are a good many processes in the manufactories where streams of air under pressures from one to thirty pounds are required, or where the air has to be exhausted, or a certain gas or vapor has to be transferred from one receptacle to another. In all such cases only a regularly made air pump with light-closing piston and its automatic inlet and outlet valves can give satisfaction.

Mr. H. Weindel, of 405 North 4th street, Philadelphia, Pa., has devised the pump shown in our engraving to supply this want for small establishments, which generally do not even have their own steam, but rent power in some large building, and have control only of a certain length of shafting, running at a given speed, and to furnish a pump that could be put up without extra expense, and started or stopped as necessity required.



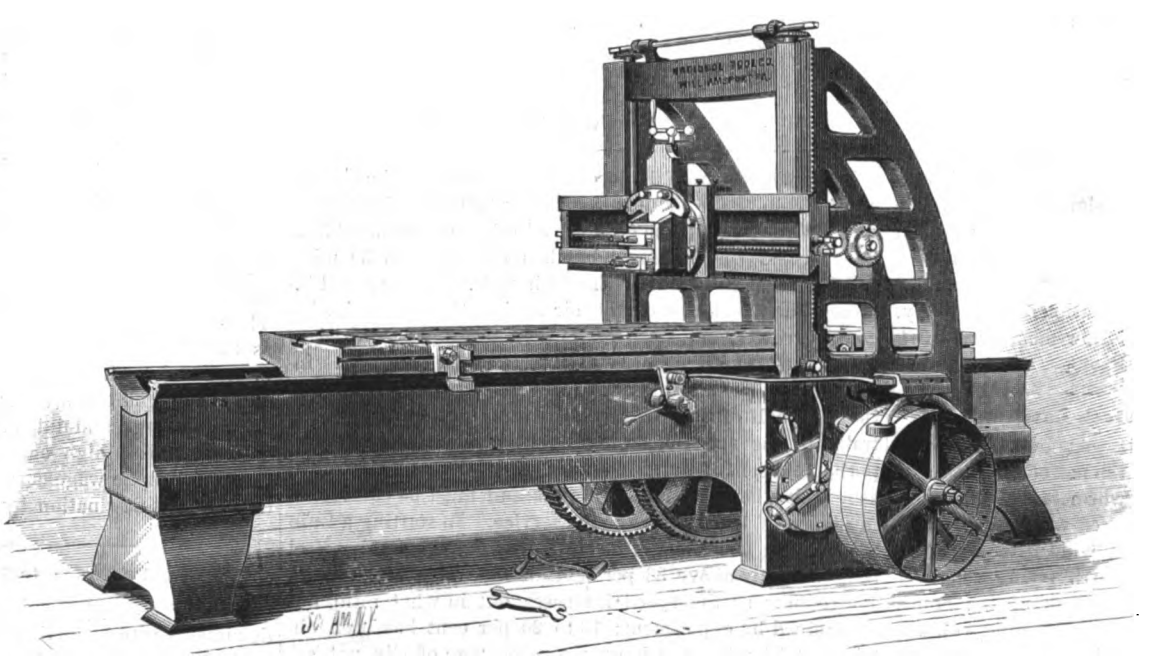
WEINDEL'S GEARED PENDULUM AIR PUMP.

There is on the top a countershaft with tight and loose pulley, flywheel, and two pinions. These latter gear into larger gear wheels provided with eccentric holes, in which the double-acting air cylinder is hung and perfectly balanced by counterweights provided on said gears. These, in their turn, are pivoted central on two rock-shafts, in which, on their upper end, the journals for the countershaft are provided. By turning this the large gears acquire a rotary motion, and as the cylinder can only move straight up and down between its guides the rock-arms will receive a pendulum motion, taking the gears with them. As thus, cylinder, crank-wheels, and rock-shafts have practically to fall a certain amount toward the end of each stroke and to be raised this same amount as long as the pressure is small, this goes a great deal toward equalizing the strain on the belts, giving a very steady motion to the pump. The outlet as well as inlet being stationary, the machine can be connected with receiver by rigid metallic pipes. The principal dimensions of the particular size illustrated are: Cylinder, 4 inches by 5½ inches stroke; double-acting inlet, ¾ inch; outlet, ⅜ inch; countershaft, 1 1/16 inches diameter; flywheel, 12 inches diameter; pulleys, 2 x 6 inches; speed of countershaft, about 260 revolutions; of pump cylinder, about 190 strokes, corresponding to 85 revolutions of crank-wheels per minute. Weight of whole machine, 130 pounds.

These machines can be built in the manner illustrated for low pressures, at least with cylinders up to 11 inches diameter; if required larger, the pulleys and belt would become too heavy. Then a steam cylinder is provided, preferably on the top, firmly connected with air cylinder by its piston-rod. The crank-wheels in this case have to be changed to fly wheels (same as on Mr. Weindel's hand pumps), and the rock-shaft is made use of to operate the valve gear in a manner similar to the engines on our side-wheelers.

IMPROVED IRON PLANER.

We give herewith an engraving of a very substantial and convenient iron planing machine made by the National Tool Company, of Williamsport, Pa. The planer is from new patterns of modern design. It is made very heavy and strong, the metal being so disposed as to resist the usual strains to which such machines are subjected. It has a very heavy table, with the slots planed true and very deep, allowing the surface to be planed many times before getting too thin above bolt heads. The pin holes in table are all reamed to standard size. The uprights are very strong and bolted to bed by heavy bolts, besides being firmly held to place by taper keys driven in suitable key ways where upright and frame join. The crossbar is also very heavy, and being provided with suitable gearing is easily raised and lowered. The frame is deep and well provided with cross-stays. All gears and racks are cut, and the pinions are of steel. The shafts are heavy, and the bearings are unusually long. The planer has cross, down, and angular feed, and is provided with an improved belt shifter, which shifts one belt from the tight pulley before the other engages it, reversing the table very quietly without shock or squealing of belts.



NEW IRON PLANER

This machine has a friction feed running free, except while feeding, causing no friction or loss of power. By a simple device the table may be run back, to measure or examine work without moving the dogs, which every machinist knows are sometimes difficult to get exactly in the right place. When planing angles with the tool head thrown from operator, the tool may be fed down by the handle on the splined cross shaft. The machine is adjustable for a fine or very coarse feed, and is easily changed while it is in motion without the use of a wrench.

This machine planes 31 inches wide, 30 inches high, and 8 feet long. The same company also make a machine to plane 36 inches wide from same patterns, at a slight additional cost. The company has the most flattering reports from users of the new planer.

Recent Accidents with Electric Wires.

While a fire company were going to a fire in Brighton, England, recently, the fire escape which they carried came in contact with an electric light wire overhead. The current followed the ironwork of the escape, giving the carriers a shock which made them lose their hold Another member of the company thought the machine was falling and grasped the steering rod to steady it, receiving a shock which disabled him for more than an hour.

More recently (August 6) there occurred at Paris a fatal accident, which suggests the use of electric wires as a bar to burglars. During a display of fireworks two men tried to climb over the railing of the Tuileries Gardens, when, laying hold of an electric wire used in the illumination of the grounds, both were struck dead instantly.

Embalming the Unknown Dead.

The authorities of Leadville, Colorado, have introduced the practice of embalming the bodies brought to the city morgue. The object, of course, is to facilitate the identification of the unknown dead, should inquiries concerning them be made within a year or two. The *Chronicle*, speaking of the large number of cases in which legal complications have arisen through the lack of means for such identification, says that it is astonishing how many missing young men, belonging to good families in the East, are constantly inquired after there. Letters of that character are received by city and police authorities, ministers, and undertakers daily, but in most instances there is no clew. People come there from their Eastern homes with no definite object in view, probably spend their means in dance halls and gambling saloons, fail to obtain employment, and are too proud and sensitive to write home for assistance. They drift into the mountains as prospectors, or into neighboring mining camps, and perhaps die of disease or accident. Thus swells the great army of the missing.

Causes of Typhoid Fever.

A severe outbreak of typhoid fever which occurred last year at Nahant, a rocky peninsula near Boston, inhabited during the summer by a small number of very rich cottage owners, was followed by an investigation, of which the results are made public in an article by Mr. E. W. Bowditch, in the *Boston Medical and Surgical Journal*. In such cases contamination of drinking-water is usually the principal cause of the spread of the disease, and the wells and cisterns which supply the houses were first examined. Water was taken from one hundred and ninety of these and analyzed. Eight of the samples were pronounced "excellent," and seventy-one others "permissible," or "good." One hundred and eleven were classed as "suspicious," "very suspicious," or "bad." About eighty cases of fever occurred, nearly all of which could be accounted for by the actual condition of the drinking water used in the houses inhabited by the patients. In a few others the filthy surroundings furnished a probable source of infection, although the water appeared pure, as, in one instance, where analysis failed to detect any serious pollution in water taken from a well situated within ten feet of one leaching cesspool and fifteen feet of another, both overflowing, and of course ready to furnish an occasional supply to the well during dry seasons or under other circumstances. One or two more were probably explained by the fact that the ice used in the household was brought from a foul pond in the vicinity; and only one seemed quite inexplicable, unless perhaps the infection might have been brought by milk contained in cans which had been rinsed in foul water. Mr. Bowditch's suspicion, that the infection was communicated in certain cases by contaminated ice, is strengthened by the fact that a very severe and fatal epidemic of typhoid fever was unquestionably caused in this way not long ago at a seashore hotel in New England; and it is worth asking whether the public authority might not be employed with advantage in exercising some sort of surveillance over the collection and sale of an article which may become, and perhaps already is, far more dangerous than the trichinous pork or immature veal against which so many precautions are taken. In one place that we know of, says the *American Architect*, thousands of tons of ice are annually gathered at the very edge of an extensive and well-filled cemetery, which slopes somewhat rapidly toward the water; and we have seen the winter product of a little pool formed by the overflow of what was practically the drain of a cluster of squalid houses regularly sold to customers.

Two New Antiseptics.

M. G. Le Bon has just presented to the Academy of Sciences two new and very effective antiseptics, the glyceroborate of calcium and the glyceroborate of sodium. Both of these compounds have the advantages of being very soluble, destitute of odor, and free from all toxic action. When exposed to the air they both deliquesce with great rapidity, absorbing from the air an equivalent weight of moisture. Both alcohol and water dissolve twice their own weight of these salts. They are powerful antiseptic agents even in very dilute solution; the most effective in a therapeutic point of view appears to be the calcic salt. It is absolutely innocuous, and it can be applied in strong solution to so delicate an organ as the eye without bad results. In a hygienic sense both can be employed with advantage as disinfectants and as preservers of meat and other alimentary products. M. Le Bon has transmitted meat simply coated with a varnish of the glyceroborate to La Plata, and it has arrived in a perfectly fresh and sound condition. He thinks both salts will prove very useful as antiseptics in Lister's mode of dressing wounds.

A Large Cattle Train.

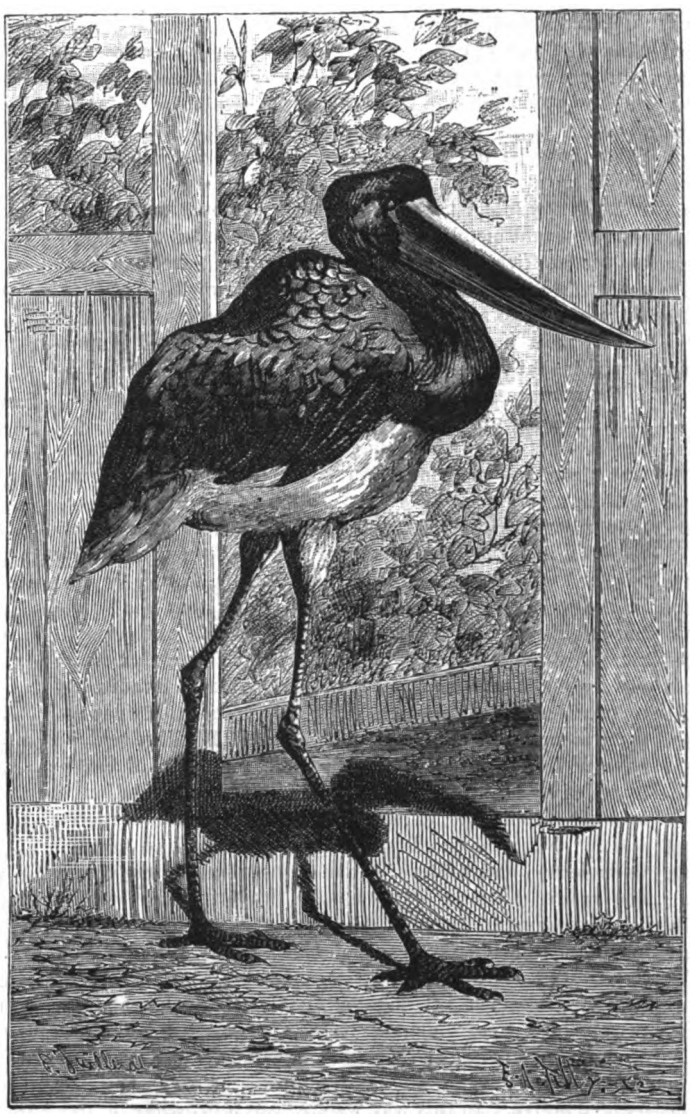
A "bull train," said to be the largest ever seen on the Yellowstone, arrived at Benson's Landing, Montana, in July. The train consisted of ten teams of three wagons each, drawn by nine yoke of oxen, making in the aggregate thirty wagons and 180 head of oxen. The freight is estimated to have amounted to 150,000 pounds, and the outfit exclusive of freight was valued at $22,000.

A NEW observatory connected with the Yale Horological bureau is now substantially finished. The main building is a small square brick building two stories high; on each side is a round brick tower forty feet high. The core is of stone, laid with great exactness. The turret-revolving roof is of iron. The first heliometer is in position, and will be used in observing the transit of Venus in December.

THE JABIRU OF SENEGAL.

The Jardin des Plantes, at Paris, has been enriched recently by the acquisition of various animals. One of the most interesting of these, without doubt, is the jabiru of Senegal, which naturalists, in their not very harmonious language, call the *Mycteria senegalensis*. This bird belongs to a genus allied to the one containing the marabou, which is so well known to those who frequent zoological gardens, and to the same family as our storks. It is impossible in examining it not to make the reflection that animals possess a physiognomy in keeping with their habits. The marabou, a bird of revolting voraciousness, which shares with the vulture the duty of disposing of carcasses and various kinds of filth lying around, is fully as repulsive in its aspect as the jabiru is attractive. It is, in fact, because the latter eats living prey and has the bold and free step of the hunter. Living in the vicinity of ponds and rivers, it hunts and fishes by turns. It often flies, which is something that the marabou rarely does, as the latter is kept on the ground by its duty as a scavenger. The jabiru lives in pairs, and the male and female of each couple never leave one another. Its area of distribution is quite an extended one. From the banks of the White Nile, as far as Senegal, having for northern limit the fourteenth degree of latitude, it lives in the whole center and southwest of Africa, although nowhere abundant.

It is larger than our stork, and its back, the upper part of its wings, its head, neck, and tail are of a brilliant black, while the lower parts of its body are of a beautiful white. Its red and black bill is provided with two pendent wattles that have been likened to a saddle, and that have sometimes given the bird the name of the saddled stork. In captivity it is a pleasant companion. It respects its neighbors, but wishes to be respected by them. Like the stork, it has great regard for its dignity and does not allow any one to injure it. According to Bennett, who has made observations on Australian jabirus in captivity, the habits of which are much like those of the Senegal bird, and according to Dr. Bodinus, who has had several of the latter in his possession, they are easy to rear and do not suffer from changes in temperature. It would perhaps be possible, then, to acclimate them in our country, where they might, while proving an ornament to our marshes, render service by destroying frogs, field mice, and other vermin. They would swallow here and there a few fish; but, since Europe will soon witness the death of the last heron, it would prove a certain compensation for the friends of animals if they could replace that by a bird of more sociable habits, and which by that very fact would be more effectually protected. The new boarder at the Jardin des Plantes, to judge from the pale tints of its plumage, is still a young bird. It does not appear to us to enjoy very vigorous health. We have seen it often, and it was always seated and making a plaintive clucking, and partially opening with a sickly air its long bill, whose upper mandible had been mended with a piece of tin.—*La Nature.*



THE JABIRU OF SENEGAL.

THE DART SNAKE, OR MILK SNAKE.

This truly pretty serpent is known by several names in different parts of the country. Thus, in the Eastern States it is generally called the "checkered adder," in the Middle States "milk snake," and in Maryland and Virginia "house snake." The name adder came originally from the Anglo-Saxon word *aetter* (poison), and is now generally applied to a venomous species, which our serpent is not. It is called "milk snake," I have been informed, for the reason that it frequents milk houses and drinks milk from the pans; yet I have been told by farmers living in districts, where I knew these serpents to be numerous, that they were *never* found in their milk houses. It has occasionally been seen in cellars and outhouses, but so also have been garter snakes, black, brown, and other snakes. Consequently all of its common names are calculated to mislead in regard to its habits. I have taken the liberty to call it dart snake, which I merely take from its generic name, *Ophibolus*. Whether this name was given on account of the arrow, javelin, or spear-head mark on its head, or from its activity or flashy appearance, I am not certain, but in either case the name is quite applicable.

DART OR MILK SNAKE.—(*Ophibolus doliatus* (Linn.) *triangulus* (Boie).

As regular steps of variation have been observed, from the red snake, *Ophibolus doliatus* (Linn.), to our dart snake, its scientific name should be *Ophibolus doliatus* (Linn.) *triangulus* (Boie), Cope. Dr. De Kay, in the "New York Fauna," named it *Coluber eximius*, not knowing that it had previously been described by Boie as *Coluber triangulum*.

The dart snake is found from Virginia to Canada, and west to Wisconsin. It measures in length from 25 inches to 3 feet 5 inches. The ground color of the body is pale gray or ash, with from forty to fifty transversely elliptical dark-brown dorsal blotches, bordered with black, and one or two rows of small spots along the sides; beneath, white, checkered with dark-brown or black spots.

Unlike our common garter and water snakes, whose young are at the moment of oviposition produced alive, this species is oviparous. The eggs are deposited under a pile of chips or dead leaves, where they are left to hatch. The young, when they first quit the egg, are about four inches in length, and are far prettier than the parent. The spots, which are brown in the adult, are bright red in the baby snakes, and they then greatly resemble the typical red snake, *O. doliatus*.

There is perhaps no snake more useful upon farms than this, for it is a great destroyer of field and meadow mice. I heard of one that was killed which had no less than four field mice in its stomach. I saw a farmer plow up in a short space of time two of these snakes, and in both cases he stopped his horses, pursued, and killed the snakes, and yet by so doing he was throwing away several bushels of grain. I have heard of one instance where one was killed in the act of devouring a young robin; but as the robin is a noted cherry and berry thief, and has a great fondness for the useful earthworm—nature's worker of the soil—he should be classed with the injurious rather than the beneficial birds, and so the snake may be excused this change of its bill of fare. I can accuse this snake of one bad act: A gentleman in New York State found one swallowing a garter snake. The gentleman wrote me that there was no doubt as to what species it was, for it agreed perfectly with a specimen in the museum labeled *Coluber eximius*. C. FEW SEISS.

The Progress of Cremation.

The president of the New York Cremation Society states that organized cremation societies exist in Italy, at Milan, Udine, Cremona, Como, Rome, Bologna, Pavia, Codogno, Padua, Genoa, Turin, Modena, Florence, Venice, Ancona, Novara, Brescia, Leghorn, Pisa, Placentia, and Parma. The subscribing members of these societies number upward of 5,000. At Lodi optional cremation is made an official sanitary institution by the municipal authorities, and so has outgrown all need of an organized society. There are also corresponding commissions to propagate the principles of cremation at Asti, Mantua, Vicenza, Reggio, and Carpi—in all, twenty-two societies and five propagating commissions.

There are established and in practical operation crematories at Milan (two), Lodi, Cremona, and Varese. There is in process of building a crematory at Rome; and it is reported that crematories are about to be built at Turin, Como, Brescia, and Padua. The actual number of crematories of human bodies at points named have been, down to the end of June, 1882: At Milan, 196; at Lodi, 20; at Cremona, 8—making a total in Italy of 219. At Gotha there have been 69 cases. In this country there have been 20, of which 14 were in the Le Moyne furnace.

The inventors and patentees of crematory apparatus are Gorini, Brunetti, Polli, Clericetti, Terruzzi, Betti, and Venini, of Italy, and Siemens, of Berlin, Dresden, and Gotha.

Gorini furnaces have been set up at Lodi, Milan, Varese, Cremona, Rome, and London, and they are preferred because adapted to any kind of light and inexpensive fuel. Siemens' method, however, has the preference of all scientific experts, as being most rapid and perfect in its work, though a trifle greater in cost than the Gorini method.

The New York Society are confident that a crematory will soon be erected near this city.

Improvement in the Gait of Trotting Horses.

The improvement in the quality of gait of the trotting horse within the last few years is one of the marvels in trotting. Only a very few years ago the jumping-jack kind of trotter was common in the very best localities. Indeed, the skip-jack gait was cultivated, and thought to be indispensable to fast speed in harness. The large majority of trainers argued that the horse must learn to break and catch before he could be relied upon in a race. For, said they, if he is not a good catcher, a break would put him behind the flag. Therefore, the horse must be spoiled before he was good for anything for a harness turf horse. A break rested him, they said. "Give him his head, let him jump a few rods, then set him down, and he can fairly fly." Such were the erroneous teachings of former years.

To-day the gait of the trotter is as smooth and regular as the play of a piston-rod; as rhythmical as the most harmonious symphonies of musical composition. Why is it so? Because fashion dictated. Mr. Bonner bought only such, and gentlemen of wealth everywhere followed his example. As soon as it became known that pure trotting gait was the salable thing trotters began to make rapid improvement in the quality of gait not only, but in quantity as well. The modern trotter is, therefore, a model trotter. This was manifestly true of the horses that participated at Chicago this year, and are now engaged in the various circuits over the country. The change is not due to any particular improvement in the trotting families themselves so much as to the new methods in use for their education. There are few horses on the turf nowadays that pull a ton by the bit as was customary at one time. To trot fast, the horse should not be hampered by any more harness than is necessary for his complete safety. Indeed, we look for the horse to trot best with no more harness than bridle, reins, back-strap, saddle, and girth at an early day.—*Dunton's Spirit of the Turf.*

William Stanley Jevons.

William Stanley Jevons, best known by his masterly work on "The Principles of Science," was drowned while bathing at Bexhill, near Hastings, England, August 15. At the time of his death he was Professor of Political Economy in University College, London.

The Largest Coastwise Cargo.

The cargo taken out by the steamer Chalmette, for New Orleans, August 12, is said to be the largest coastwise cargo ever taken from this port. It comprised 400 car loads of miscellaneous freight for New Orleans and Texas. The Chalmette has a carrying capacity of 9,000 bales of cotton.

The Easily Oxidizable Substances in Plants.

Many expressed vegetable and fruit juices, it is well known, gradually darken when exposed to the air. In other cases, the cut surfaces of roots and branches, of leaves and fleshy fruits, slowly acquire a brownish tone. This interesting property, which is of some importance for an understanding of the chemical properties of the living cells of plants, has been recently more closely examined in his study of the chemistry of protoplasm.

There can be no doubt that this phenomenon is due to an oxidation of certain substances in the sap, or juice, by the oxygen of the air. For, if we grate up some potato tubers, for instance, the upper layer of the magma, which is in contact with the air, takes on a reddish color, and by frequent stirring this red color can be imparted to the entire mass. The juice that is expressed from potatoes has a yellow color, but in the air it rapidly acquires a reddish violet, finally a brown color. In time this color penetrates deeper and deeper, until finally the juice looks like brownish-black ink. By the exclusion of the air, the potato juice can be preserved for a long time colorless. On the other hand, it has been observed that this juice, which had become black if left standing until decay and fermentation began, loses color again, and that this can be accomplished by certain reducing agents like sulphur dioxide and sulphydric acid gases. [In the manufacture of evaporated apples the brown color is removed by burning sulphur before the drying is begun.—TRANS.]

The juice of the sugar beet, the pure white *Beta vulgaris*, is still more sensitive to the oxidizing action of atmospheric oxygen. In contact with air it immediately turns a dirty wine-red, then purple brown, and finally almost black.

These facts show that easily oxidizable substances are present in the living cells of plants, and that they attract atmospheric oxygen with avidity, forming with it oxidation products. Since these products, which are so easily recognized by their dark color, do not occur in the unwounded cells, it follows that there is either no free oxygen within the cells, or that, besides these oxidizable bodies, there are other substances having reducing properties, which prevent the oxidation of the former, or that in protoplasm oxidation produces other substances which are colorless.

[A fourth possibility which Reinke did not consider is that this easily oxidizable substance is produced by rubbing, cutting, or crushing of the cells.]

To decide which of these three supposable cases really exists is not yet possible. It is worthy of notice that a sugar beet cut smoothly across preserves the surface colorless for a long time, while the grated tissues rapidly darken.

The importance, from a physiological view, of the occurrence of an easily oxidizable substance need hardly be mentioned. When engaged in the study of the existence of oxidizing processes in the living cells of plants, one of the first questions that presents itself is, whether there are substances within the cell which at ordinary temperature unite with the oxygen of the air without need of the active assistance of living protoplasm.

To get a nearer view of this oxidizing process, it is, first of all, necessary to isolate that oxidizable substance and learn its chemical composition. For this purpose Reinke made the following successful experiments with the juice of sugar beets and potatoes.

He first proved with certainty, by chemical test, which we need not repeat here, that in the cells of the sugar beet there is a chromogen, soluble in water, but precipitated by acetate of lead, which can be extracted by ether. He named it *rhodogen*, because it oxidizes in the air to a red dyestuff. A direct chemical analysis was impossible because it changed so easily in the air. The properties of the red dye, "beta red," formed by the oxidation of the rhodogen, were examined. The chemical reactions, as well as the physical properties, particularly the absorption spectrum, exhibited so striking a similarity to alkanet red, that the two dyestuffs must stand very near each other chemically. At all events, like groups of atoms must be present which produce the characteristic spectra. The only difference was that the alkanet red changes less readily in the air than beet red.

"This investigation proves that there exists in the colorless cells of the sugar beet an isolatable, very easily oxidizable, colorless body, which of itself, without the aid of living protoplasm, is able to split the oxygen molecule (by reduction if you wish), and to oxidize itself to a colored substance."

The fact already mentioned, that the cut surface of the beet can lie exposed to the air for days and remain colorless, that no "beet-red" is formed in the living cells, seems to point to a noteworthy distinction between living and dead cells. Reinke does not think it probable that the absence of free oxygen in the living cell is the cause of its remaining colorless, nor that the oxidized rhodogen molecule should be immediately reduced again in the living cell. He considers it more probable that in the living protoplasm of the cell rhodogen suffers a much more energetic oxidation than in the air, so that instead of forming a dye, the rhodogen molecule is totally destroyed, forming carbon dioxide and other end products.

The isolation of the chromogen of the potato did not succeed so satisfactorily as with the beets. By a series of reactions a substance was obtained from the juice of the potato, which, of the known aromatic acids, corresponded most nearly with the hydrocaffeic acid. The quantity obtained was too small for a nearer chemical analysis.

The root tubers of the dahlia also yield a juice that becomes colored in the air. Similar treatment of this juice showed that they contain an easily oxidizable substance like potatoes.

Similar oxidizable bodies were discovered in the *Æthalium septicum*, and the juice of the grated roots of *Daucus carota*.

The general results and conclusions are thus summed by Reinke:

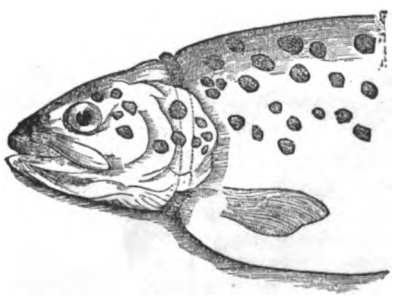
These experiments prove that there exist in the tissues of plants of very different families easily oxidizable substances, which probably belong to the aromatic series. That these substances perform a not unessential function in the exchange of matter can scarcely be doubted. In quantity, it is true, they are inferior to other constituents, and it would be a very tiresome and tedious labor to establish their exact chemical constitution, because for this purpose large quantities must be used. But it is just those very substances which are always present in very small quantities that interest the physiologist, because they are supposed to belong to the important members in the process of the interchange of matter (stoffwechsel), and which, therefore, never can accumulate in large quantities, but without a knowledge of them there can be no real understanding of that process.

The most natural hypothesis regarding the bodies mentioned is that from a physiological point of view they belong to the retrogressive series, and are, perhaps, formed directly by a splitting up of the albuminoids, or by synthesis from the products into which they split. We may also surmise that there is some connection between them and the functions of breathing.

In regard to this last point a short remark may be permitted. If in the living cell, for example, the rhodogen is oxidized to carbonic acid and water, and the former escapes in the breathing process, we could think that the whole breathing of the sugar beet consisted in this oxidation of rhodogen, and that other substances like sugar, that disappear in the breathing process, are only consumed indirectly to produce more rhodogen. But this supposition does not seem to me to be the most probable one. I believe that we have no cause for doubting the direct oxidation of carbo hydrates by taking up oxygen; only such an oxidation is scarcely supposable unless the oxygen is first rendered active. Now, inasmuch as the rhodogen is able to split the O_2 molecule, and unite with one of its atoms of oxygen, it may render the other oxygen atom disposable for carrying out an energetic oxidation elsewhere. Thus, rhodogen may act as an oxidizing agent, analogous to what Hoppe-Seyler has proved for atomistic hydrogen. The theory advanced by the last-named investigator of physiological oxidation, permits of a great widening, if we grant that not only nascent hydrogen, but also certain compounds which break the molecule of oxygen, possess the power of rendering the oxygen active. In this way we arrive at a principle of oxidation which is capable of the broadest application.—*Naturforscher, No.* 20.

TROUT WITH ELASTIC BAND.

Our correspondent, Mr. W. Hearder, of Plymouth, has sent us the following drawing to illustrate a curious circumstance of a trout not only living but thriving with its gills compressed in what one would imagine to be a very painful manner, highly prejudicial to health. Mr. Hearder writes: "Mr. Charles Clarke, while fishing in the Plym, hooked a trout about eleven inches long, which had an India-rubber band over the head. The band slipped back over the gill



covers, and was compressing the gills. The horny part of the fish, which extends from the center of the lower jaw to the belly and divides the gills, is deeply dented where the band has evidently been pressing, and it has made quite a cavity under the lower jaw. I should like to know if anybody has marked the fish with the band, or whether it got its head through in an attempt to take it for a bait. How the fish lived is a mystery. It is in splendid condition, and I have preserved it for my museum."—*Land and Water.*

How Singers Should Live.

Women singers, especially in the country, are addicted to three habits which are about equally prejudicial to them as singers. These three habits may be described as the habit of taking irregular and insufficient food, the habit of tight lacing, and the habit of eating candy. I know half a dozen bright American girls, who have really excellent prospects as singers, whose voices are already beginning to betray the fact that their owners live on "lunches" and "candy" rather than three square meals a day. It is very certain that there never will be any tone to a voice that comes from an insufficiently and irregularly nourished body. On the subject of tight lacing a book might be written with ease. Many a girl who now finds great difficulty in taking a high note might do so with comfort if she would only give herself room to breathe. In brief, it may be truly said that no teaching however able, no industry or talent however great, in the pupil can amount to anything unless the would-be singer is content to live a good, clean, honest, healthful life, trusting to good common-sense rules of living, and plenty of fresh air rather than to quacks and nostrums. If vocal teachers, before commencing their lessons, would take the trouble to find out how the pupil lives, and would refuse to give any instruction until the pupil was ready and willing to conform to the simplest rules of hygiene, a great many troubles, especially throat troubles, would be avoided, and the act of singing, instead of being a painful, miserable, ear torturing effort, would be easy and as pleasurable to the singer as to the listener. The rules of life, which the student should observe, are just as important for the singer, private or public; if anything they are more so, for the strain is greater. One thing is certain, the reliability of a singer depends absolutely on the method and manner of life.—*Music.*

Earth Vibrations.

Professor H. M. Paul ingeniously employs reflected light as a means of testing the vibration imparted to the earth by moving vehicles. His arrangement is a very simple one. He sinks a stout post some four and a half feet into the ground, and upon this is a plank supporting a reservoir of mercury—or, rather, of amalgam of tin and mercury. The surface of the mercury is obviously a mirror, and when any vibration is felt by the earth the surface of the mercury is disturbed more or less. An object of a suitable kind is reflected upon the mercury surface, and when there is no vibration this reflected image is, of course, sharply defined. As soon, however, as any vibration occurs, the image moves, and becomes more or less exaggerated.

Professor Paul has hitherto employed a telescope to note the amount of vibration, taking optical notes the while; but the *Photographic News* thinks there is little doubt that photography would help materially in registering the degree of change or vibration. He has found that an express train passing at a distance of one-third of a mile affects the mercury very considerably for a space of two or three minutes, and a one horse vehicle, passing at a distance of five hundred feet, caused a disturbance of the image on the surface of the mercury whenever one of the carriage wheels passed over a stone.

A Dinner Within a Statue.

A few days ago M. Bartholdi, the designer of the colossal statue of "Liberty Enlightening the World"—which is to be erected near New York in commemoration of the American War of Independence—entertained a party of his friends at luncheon. The table was laid in the lower folds of the drapery of the figure. MM. Gaget, Gauthier & Co., of Paris, the contractors for the erection of the statue, have been obliged to take a plat of ground adjoining their foundry, and covering 3,000 square meters, upon which the scaffolding has been fixed. The interior of the statue contains an iron backing, to which are attached the exterior parts, consisting of bronze plates, about one-tenth inch thick by 4 feet 7½ inches square—the largest size made in the trade. The plates are kept together by rivets that are invisible from the outside. The plates of bronze are made to correspond with the contours of the model in an ingenious way. A skeleton of fine wickerwork was first formed, and this was covered with a thick coat of plaster moulded to an exact reproduction of the original. Upon the plaster 6-inch templates of thin wood are adjusted, and are then given to the bronze-workers for models. The weight of the figure will be about 150 tons; the height from head to foot about 110 feet; and from the end of the torch raised in the right hand to the feet, 140 feet. The cost of execution will exceed £28,000, and the work will require five years for completion.

Torpedo Experiments at Newport.

The examination of the graduating class at the Newport Torpedo School was completed August 4. Part of the exercises consisted in a public test of the device of Captain T. O. Selfridge for protecting a ship at anchor from an enemy's torpedo by means of a net and countermines. The vessel is surrounded by a line of torpedoes, which can be individually exploded so as to destroy an attacking torpedo passing near it. The same device can be used to guard the entrance to a harbor.

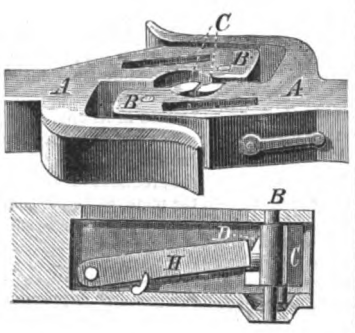
Another important experiment was a demonstration of the working and efficiency of Lieutenant J. C. McLean's electrical machinery for controlling the movement of a torpedo launch from the shore. The launch, no one being on board, was made to start, stop, back, go to port and to starboard, and to drop and fire mines and countermines, which were rigged at the ends of spars placed on each side of the launch's bow. Lieutenant-Commander Royal B. Bradford, who was at a keyboard on shore, had perfect control of the launch by the aid of one wire. The electrical part of the experiment was in charge of Lieutenant-Commander Caldwell, who was in the electrical building at the torpedo station, at a long distance from the spot where the keyboard was located.

THE State Bureau of Statistics has compiled from the reports of township assessors a statement of the number of rods of drainage tile laid in the several counties of Indiana. The aggregate shows nearly 26,000 miles of tile drainage, with nineteen counties to be heard from.

RECENT INVENTIONS.

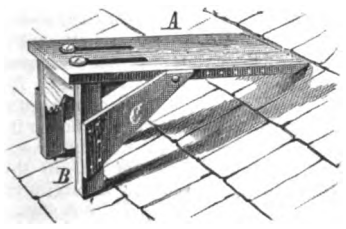
Car Coupling.

An automatic car coupling recently patented by Mr. Michael J. McCrone, of Louisville, Ky., is shown in the accompanying engraving. The drawhead of the car is U-shaped, and in the end of one of the shanks a short vertical spindle, B, having a curved lateral hook, C, on one side and a spiral shoulder, D, on the opposite side, is journaled. In a recess in the shank, back of the spindle, B, a latch, H, is pivoted that is raised and lowered by a cam finger attached to a transverse shaft journaled in the side of the drawhead, and is operated by a series of levers attached to a chain reaching to the top of the car. The latches, H, rest in the bottom of the recess with their ends against the bottom of the spiral shoulder, D, and prevent the hooks, C, from swinging outward. In coupling the hooks, C, will face each other, and swing inward sufficiently to allow the shanks of the drawhead to pass into each other, when they swing out and the cars are coupled. When the latch, H, is raised and the cars drawn apart, the hooks, C, turn each other outward and the cars separate.



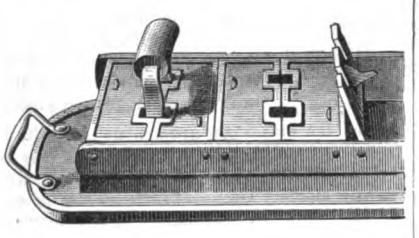
Roof Seat.

A novel and convenient seat, designed to be used in shingling roofs, has been patented by Mr. William P. Thomson, of Joliet, Ill. In the cut A is the top of the seat, B the front perpendicular support, and C side braces uniting the two. The top is secured to the front support by screw fastenings that pass through longitudinal slots in the top, thereby adapting the seat to roofs of different inclinations. To adapt the braces, C, to this adjustment of the top they are rigidly secured to the sides of the support, B, but are adjustably attached to the top, A, by screws that engage with a series of holes in the sides of the top. The back end of the top and the bottom of the support are each provided with spurs to prevent the seat from slipping on the roof. The seat is simple, firm, easily constructed, and well adapted for shingling roofs.



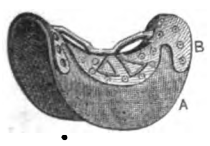
Sad Iron Heater.

The accompanying engraving shows an improved sad iron heater patented by Mr. Platt McDonald, of Plymouth, Ind. The heater consists of a metal box provided with transverse swinging lids, having lugs projecting from the under surfaces, and also having recesses in the swinging edges. When the sad iron is passed into the box the bottom of the iron strikes against the lugs and closes the lids automatically. The lids are also opened automatically when the sad irons are withdrawn and the lids are provided with check studs to prevent them from opening too far. The heat is retained in the box, as the lids fit closely to the sad irons.



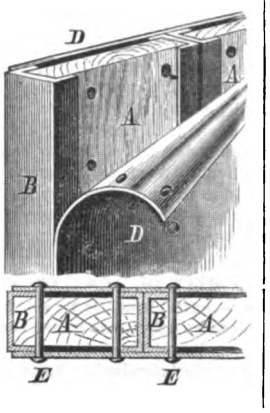
Horse Collar Cap.

The device shown in the accompanying engraving is a new horse collar cap, recently patented by Mr. Andrew Waugh, of Carthage, Jefferson county, N. Y. The collar cap, A, differs from the ordinary cap by having the ends more rounding, and it is secured by rivets to a malleable iron frame, B, of the form shown in the engraving. The part of the frame between the middle and the ends is made narrow, so as to be more flexible; the middle is in skeleton form, and the ends are perforated to allow the air to come in contact with the cap, A. Loops are formed on the top of the frame for the collar straps to pass through to hold the cap to the collar. The advantages are that as the cap is more rounding it is not so liable to chafe the horse's neck, and the frame being made so as to be flexible is easier accommodated to the shape of the neck. The perforations keep the cap cool and comfortable, and the loop for the collar straps being iron will not wear out by coming in contact with the hame strap.



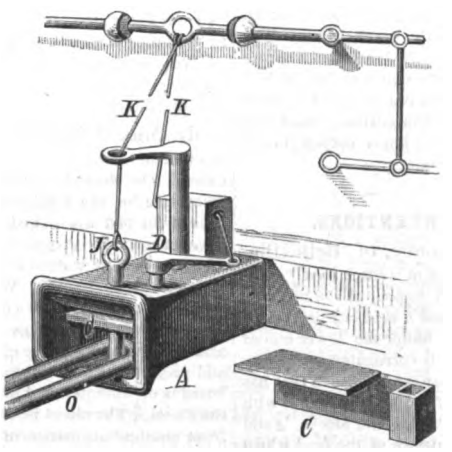
Fireproof Shutter.

An improved fireproof shutter that will not warp by heat has been patented by Mr. Cornelius Berrian, of Clinton, Ia. The shutter is formed of strips of wood, A, against the edges of which are placed channel irons, B, as shown in the engraving, the flanges of the irons overlapping the strips on the sides. The backs of the irons are in contact—as shown—and on the inner and outer sides of the shutter are metal plates, D, held to the shutter by rivets, E, that pass through the plates and the strips, A. As the plates rest on the flanges of the channel iron, B, small air spaces are formed between the plates and the surface of the strips, A, that protect them from heat, and the strips prevent the channel irons from warping. Even if the wooden strips are charred the shutter will not break, as the rivets hold it together.



Car Coupling.

Mr. Peter Zehner, of Mifflin, O., has patented a car coupling that operates automatically for coupling, and can be uncoupled from the outside of the car. In a recess in the drawhead, A, of the car is journaled a vertical shaft, D, to which is attached a swinging flanged plate, C, the flange projecting toward the outer end of the drawhead when the plate is thrown forward. The shaft is provided at its upper end with an arm projecting at right angles to the swinging plate. A rope, K, attached to the end of the arm passes through a block on the drawhead, and is attached to levers that can be operated from either the top or side of the car. The coupling pin, J, is also attached by a rope to the same levers, and when the levers are pulled the pin is raised from the coupling so that the link, O, can be withdrawn, and at the same time the flanged plate swings under the pin opening, so that when the levers are released the pin will rest on the flanged plate. When the cars are coupled the link strikes the plate, pushing it back, permitting the pin to drop and couple the cars.



LONDON FIRE SERVICE.

Capt. Eyre M. Shaw, Chief of the London Fire Department, now visiting this country, gives a number of interesting facts with regard to the system and material for fire protection in use in London.

The area to be protected is 121 square miles. The force employed numbers 536 men and officers of all grades, one-third of the number doing duty by day, and two-thirds by night, each set working twelve hours. The equipment of the department comprises 53 land fire engines, 121 fire escape engines, three floating steam fire engines, eleven movable land stations, four floating stations, three large land fire engines, thirty-five small steam land fire engines, two steam tugs, four barges, twenty-nine hose-carts, fifteen vans and two trollies.

The movable land stations are large vans that are taken to a designated spot every night at 8 o'clock, each one drawn by four horses. The horses are then returned to the engine-house to which they belong. They are sent the next morning at 8 o'clock to fetch the vans back. In each van is an engine and a number of men, who are always ready to attend a fire in the immediate neighborhood where the van is stationed. The department is forced to use these movable stations on account of the cost of building permanent stations. The engine does not leave its place, but depends upon its length of hose to reach a fire.

The system of telegraph alarms fifty-three telegraph lines with forty-four "call points" or alarm boxes, and seven telephone lines. The intention is to replace all the telegraph lines with telephone lines. The city is divided into four sections or fire districts, each with a central office, communicating with headquarters. The area covered is so great that a single system like that of New York would not answer.

Captain Shaw was greatly interested with the method employed in this city of loosing the horses from their stalls by electricity on the sounding of an alarm, and the automatic harnessing. The London horses stand in their stalls harnessed. All the London firemen are given a two-months' course of instruction and systematic drilling before they are sent out for actual service. The department has discarded rubber hose entirely, and use "fabric hose," which is much lighter, costs one-third as much, and lasts three times as long. It is manufactured at Dundee.

Telephone Sounds.

The *Operator* says: "Mr. Nat. G. Warth, manager of the Midland Telephone Company, Gallipolis, O., writes: 'Please give some one the chance of explaining this phenomenon. This morning early, while in temporary communication over a Western Union wire with Major R. B. Hoover, at Pomeroy, O., twenty miles away, I could distinctly hear the croaking of frogs and the singing of birds. The wire passes through dense woods and along large streams between the two points. There were only the two sets of instruments in circuit. The sounds certainly were taken up and transmitted from some point between us. Now, by what law could this occur? Could the sound have been induced by a damp atmosphere?'"

The *Review of the Telegraph and Telephone* says: For want of a better explanation, we put forward our own ideas:

Every telegraph line, and every telephone line, too, for that matter, has necessarily a certain number of joints in it; every one of these joints is, unless soldered, a microphone of more or less power; the more perfect the joint the less perfect the microphone, and *vice versa*. A microphone is nothing more or less than two or more conductors connected together electrically by an imperfect joint. The Blake transmitter is a good example of this. In it, the point of contact between the button of carbon and the point of platinum is the imperfect joint, which, when varied ever so slightly, correspondingly varies the resistance of the circuit, thus producing changes in the strength of the current; these changes in turn causing variations of the magnetic power in the telephone magnet, which of course are made manifest to the listener by noises in the telephone identical in character with those originally inducing the varying resistance of the bad joint.

A battery current on the line is, however, necessary to vitalize the imperfect connection, and enable it to act microphonically.

Our explanation, then, from the foregoing premises, is this:

The line in question had at some point near the locality where the frogs were croaking and the birds were singing in the morning an imperfect joint, which was affected by the noises of the vicinity, and its resistance accordingly varied. Being a Western Union wire, it is possible that a battery was at the time in circuit, though unmentioned by the inquirer.

But, if such was not the case, it is unquestionable that sufficient current would constantly leak from other and parallel telegraph wires to charge the wire which was being used at that time for telephonic communication.

This effect might be aided, and probably was, by the damp atmosphere referred to.

Proposed Dutch Colonial Exhibition.

The plan of the Colonial Exhibition to be held in Amsterdam, Holland, next summer, has been extended so as to admit exhibits from all countries. It is now styled an "International Colonial and General Export Exhibition," and will be divided into five sections:

(1) A colonial exhibition, (2) an exhibition for export trade, (3) an exhibition of fine arts and arts applied to industry, (4) special exhibitions, (5) scientific conferences. This last division will include meetings for the discussion of subjects pertaining to colonial public education, teaching, domestic and public hygiene, political economy, the relations between colonies and the mother countries, etc. The exhibition will offer special advantages to manufacturers who make articles likely to find a sale in any of the Dutch colonies, as these latter will be well represented at the Exhibition by their products and agents. Articles for exhibition must be on the ground before the 20th of April, 1883. The Exhibition will open in May and close in October. Information and application forms will be given by the Netherlands Consul, 47 Broad street, New York.

The Rag-Pickers' Harvest.

As many as 2,000 rag-pickers find employment about the streets of this city. They are almost exclusively Italians, who have displaced the Irish and Germans who used to do the work. Their gatherings of rags are valued at $750,000 a year. The hand-cart dealers do a business of $3,000,000 a year. The aggregate rag trade of the city amounts to $30,000,000 a year. A prominent dealer estimates the number of rag dealers in the city at 800, about a fifth of them doing a large business. The general trade is controlled by a few extensive dealers. Last year the cotton rag importations reached $10,000,000 in value, the home gatherings being worth $12,000,000; the paper mills taking the whole supply. The cotton rags are worth from 1¼ to 6 cents a pound; the woolen rags from 3 to 35 cents a pound. The latter are used in making shoddy goods. The rags are sorted by women, who earn $5 a week, and packed by men, whose wages range from $12 to $14 a week. Some of the larger dealers have accumulated large fortunes.

MECHANICAL INVENTIONS.

Mr. Auguste Jacques Hurtu, of Paris, France, has patented improvements in the class of sewing machines employing a circular stationary bobbin and a rotary hook. The shaft carrying the hook is made in two parts, connected by gearing so constructed that while the main shaft receives continuous uniform rotary motion, the other part which carries the hook receives, during part of each revolution, a faster or slower motion than the first, in order that the needle thread shall be thrown rapidly off the shuttle. The bobbin case is held in place and released at will, and the plate to which the devices for holding the shuttle are attached is also easily removed and replaced.

New and useful improvements in car frames have been patented by Messrs. Thornton A. Brant and Calvin D. Harris, of Mattoon, Ill. The end sills, side sills, and stringers of a railroad car frame are connected by angle irons, so that the sills and stringers can be readily detached and replaced when desired without disturbing the car floor. As no mortises or tenons are required in making the frame, lighter timbers can be used than when the frames are constructed in the usual manner.

An improved expansion joint for metal tubing has been patented by Mr. John J. Moss, of Chicago, Ill. A tube whose diameter is slightly greater than the tubes to be joined has its middle portion formed into a spiral by cutting a helical V-shaped groove entirely through its walls. This part of the tube forms the joint proper. A case and proper devices for tightening and loosening the joint are provided. The ends of the pipes to be joined are passed into the joint, and the devices tightened, the pipes being held tight enough to prevent their contents from escaping, and loose enough to permit the pipes to expand and contract from changes of temperature.

Messrs. John Creagan and Charles D. Tyler, Jr., of Cleveland, O., have patented a machine to facilitate the setting of springs. To the end bars of its frame two rods are attached that serve as guides for sliding plates that move on the rods. On the surface of these plates is a series of movable transverse bars, placed in such a position that the form of the space between their adjacent ends shall be of the desired shape of the spring. These bars are rigidly held in place by suitable devices. One of the sliding plates is moved back and forth by a screw, and when the spring to be set is placed in the space between the transverse bars the screw is revolved, and the plates close together, setting the spring as desired.

An improved carriage brake has recently been patented by Mr. Walter R. Mortimer, of Rogate Lodge, Eng. In constructing the brake, a sleeve that projects toward the carriage is attached to the rear end of the hub, and beyond the sleeve, on the axle, is a disk provided with a projection extending beyond the sleeve. Inside of the sleeve on the wheel a divided spring ring is placed, that is covered on its outer surface with leather, and is of such a size that the wheel can revolve without friction. The sleeve is connected to a lever secured to the projection of the disk, in such a manner that when the lever is moved the spring is pressed out against the sleeve, acting as a brake to the wheel.

An improved tool for setting or extracting jewels in watches has been patented by Mr. William B. Atkinson, of Franklin, Ky. The bed plate of the tool has the usual slots and clamps by which the plate to be jeweled is held in position, and is secured to the lower arm of a bracket, the upper arm of which is perforated vertically for holding a cranked drill rod, in the lower end of which the jeweling tool is secured. The watch plate is centered on the bed plate at the point to be jeweled, and by the use of properly shaped tools inserted in the lower end of the drill rod, the hole is prepared for the insertion of the jewel.

An improved jointer in which a number of shingles may be jointed at a time has been patented by Mr. Robert Holbon, of Alpena, Mich. The machine is provided with a number of saws secured at different distances apart upon a mandrel by means of collars and set screws. The edges of the saws project a little distance above a table, and roughened feed rollers that revolve near the table carry the shingles to be jointed past the saws. As the shingles leave the machine they are struck by the ends of revolving arms and separated from the refuse of the machine.

An invention for governing the motion of mechanism, in which a train of wheels is driven by a weight, has been patented by Mr. Thomas R. Gibson, of Fremont, Neb. Upon a suitable frame, a train of gear wheels is placed, and to the shaft of the primary wheel is connected a rope that passes over a pulley and carries a weight. A centrifugal governor is connected to a lever, placed above a brake wheel on one of the shafts of the train, so as to bear on the rim of the wheel when brought down by the rise of the governor balls. The governor is operated by a belt connected to a pulley on the power shaft at the end of the train.

An improved machine for boring the fellies of wagons has been patented by Mr. Vincent Cox, of New Vienna, O. The frame of the machine consists of a base upon which the felly rests, having an open guard on its front against which the front of the felly bears. A horizontal bar projects from the front of the base, that has at its outer end an eye, in which a vertical post is adjustably secured, forming a bearing post for the shaft of the auger, the shaft fitting loosely in the post. With this construction a straight hole may be bored through the felly without gauging or marking.

ELECTRICAL INVENTIONS.

Mr. Louis H. Spellier, of Doylestown, Pa., has patented an electric motor for clocks. The motor consists of a wheel or disk with a series of armatures, and a corresponding series of inclined teeth combined with an electro-magnet which acts upon the armature, and with a weighted lever with bearing roller resting upon the inclined teeth, the parts being arranged to produce a progressive intermittent feed movement of the wheel in one direction, one movement being effected by the magnets in attracting the armature, and then, when the current is broken, the weight-bearing roller, acting upon an inclined tooth of the wheel, causes the wheel to move farther in the same direction, bringing another armature within the range of attraction of the magnet.

An automatic circuit closing device, applied to a telegraph key of ordinary construction, has been patented by Mr. John A. Timmerman, of Odessa, Can. The closing device consists of an auxiliary lever hung at one side, and on one of the pivots of the lever of the key, its forward end, extending upward through the key button and above the button, is provided with a disk. At its rear end the lever is attached to a spring that draws it and raises the disk above the key button, and it also closes the circuit. When the telegraph key is used the disk is held to the top of the key button, opening the circuit by the action of the auxiliary lever, but when the key and disk is released, the spring closes the circuit automatically.

Mr. William S. Parker, of New York city, has patented a dynamo-electric machine in which the heating produced by induced magnetism in the bars of the armatures is greatly reduced. The armature consists of a shaft to which are attached circular heads, and to the edges of the heads at equal distances are secured bars of soft iron provided at each side with flanges, the flanges forming the poles of the armature magnets. The armature bars are wound lengthwise, and the wire is retained by the flanges. Spaces are left in the flanges at suitable intervals for the air to circulate freely, and the spaces also serve to prevent the circulation of currents. The pole blocks of the machine are cast and fitted on their faces with bars of soft iron, the soft iron being more easily magnetized, and inducing a more powerful action in the machine.

Mr. Robert J. Pratt, of Troy, N. Y., has recently patented improvements in electric arc lamps, by which the carbons of the lamp are automatically regulated and held a constant distance from each other. Clamping devices operated by an electro-magnet hold the upper carbon until its lower end is so far burned away that the current is weakened and the carbon drops into or nearly into contact with the lower carbon. The lower carbon is balanced between the tension of a spring which carries it up, and an electro-magnet that pulls it down. If the upper carbon drops too close to the lower one, the increased strength of the current causes the electro-magnet to bring down the lower carbon to the proper distance from the upper one.

AGRICULTURAL INVENTIONS.

Mr. Adolphus F. Gibboney, of Belleville, Pa., has patented improvements in "force feed" seeding machines. The frame and hopper of the machine are of the usual construction, and a seed cup is secured to the lower face of the frame under the lower end of the hopper. A feed wheel that is corrugated on its surface is revolved in the seed cup, by a sleeve that has corrugations on its inner surface to correspond with the corrugations of the feed wheel. The sleeve is slid by means of a lever upon the surface of the feed wheel to form a cut-off, for increasing or diminishing the quantity of grain sown. The lower edge of the opening in the seed cup is oblique to the corrugations in the feed wheel, this form of opening distributing the grain more evenly.

Mr. Thomas Bower, of Waterburg, N. Y., has patented improvements in tree protectors. The protector consists of a series of upright slats, that are spaced to admit light and air, and held together by elastic bands. These slats encircle the tree for a limited distance from the ground, and terminate at their ends in outwardly bent barbed extensions, and may be made wholly of iron or steel, or partly of wood, and the bent portions of metal.

Improvements in hay and cotton presses invented by David P. Burkett, deceased, have been patented by K. M. Burkett, administratrix. The press box is provided with two followers, each operated by separate and independent mechanisms. When the box is filled one of the followers is driven forward by a hand wheel to its full movement. Power is then applied by levers to the opposite follower, thoroughly pressing the bale. The doors of the box are then opened, and the bale removed.

A device by which trash is removed from in front of the hoes of grain drills, without stopping the drill or raising the hoes from the ground, has been patented by Mr. Slaughter G. Major, of Haynesville, Mo. A gear wheel formed of three segments is attached to the axle of the drill, and each segment has four teeth that mesh into a four-toothed segment attached to a shaft, from which arms hang the sides of the drill hoes. When the axle is revolved, the segments engage and move the shaft forward, giving a forward movement to lower ends of the arms, and clearing off the trash accumulated in front of the hoes. A spring throws the shaft back when the segments disengage.

Mr. John Quin, of Wakeman, O., has recently patented improvements in constructing mould boards of plows, that consist in the peculiar formation of the exterior concave surface of the mould board, and also in the method of laying out and constructing the mould boards, so that they shall be adapted to do their work in the best manner possible, and with the least amount of draught.

MISCELLANEOUS INVENTIONS.

A portable head rest to be used in all kinds of public conveyances has been patented by Mr. William H. Wooldridge, of Louisville, Ky. At the upper end of a standard is pivoted an annular wire frame suitable for supporting a pad or cushion. The standard has a central longitudinal slot, in which a thumb screw is inserted, and on its rear side is placed a slotted bar, through which the thumb screw passes and secures it to the standard. Below the slot the bar is curved and serves as a clamp to hold the head rest to the back of the seat. The standard and bar both being slotted allows the device to be made much shorter, and it may be used either upon the end of a seat for lying down or upon the back as a head rest.

An improved earth closet has been patented recently by Mr. Henry J. Behrens, of New York city. The seat is attached to the inner side of the wall of the closet, and above the seat on the outer surface of the wall is attached a hopper, having in its upper part a sliding sieve, that has a handle for reciprocating it. The bottom of this hopper is closed by a slat fastened on the top of a hopper that is hinged to the bottom of the seat, and supported by a weight in a vertical position under the upper hopper. A rod attached to the hopper for moving it projects from the seat. By suitably arranged devices, ashes placed in the upper receptacle are let down in small quantities to the swinging hopper, and when the rod is pulled the hopper is inverted and the ashes fall to cover the excrements in the pit under the seat.

Mr. Alexander L Griffith, of Beallsville, O., has patented improvements in triangular road scrapers, by which they may be easily moved from place to place, and by which the depth of the cut may be regulated. Near each end of the land side of the scraper are pivoted small wheels that serve as transportation wheels and also hold the scraper against lateral pressure. At the rear end of the mould board plank of the scraper is placed a wheel that is adjusted up and down by means of a lever secured to the mould board by a pivot. By operating the lever the lower edge of the board may be given any desired upward inclination toward its rear end, so as to round up or raise the middle part of the roadway.

Mr. Robert W. Chambers, of Sidney, O., has patented improved devices for loading and unloading sulky earth scrapers. The scraper is of the usual form and has small wheels near its rear end, and has its end gate hinged near its upper edge, so as to swing out when the forward end of the scraper is elevated. For holding the end gate when loading the scraper, pins pass through recesses at the rear edge of the scraper bottom. The pins are secured to a shaft underneath the bottom, and moved up and down by means of a hand lever, which when the pins are up is retained by a keeper. The scraper is drawn by bars pivoted to its front and to the tongue, and the front end is raised for dumping the earth by means of chains attached to sheaves on the axle, the axle being revolved for winding the chains by being geared to one of the wheels by a sliding clutch.

Mr. Max Hallheimer, of Brooklyn, N. Y., has recently patented a combined folding bedstead and closet. The closet is placed upon a base that forms a receptacle for the pillows and bed clothes. The side rails of the bed are hinged to the top of the base, and have an inwardly projecting flange at the bottom, and are connected at their free ends by a foot board to which they are hinged. When the bed is folded, the rails rest against the sides of the closet, and the flanges against the front, the legs of the foot boards resting against the under surface of the flanges of the side rails, and projecting from the top of the closet. The foot board is ornamented and forms an ornamental top for the closet. The closet is divided by a partition into a front and rear compartment, and the front is provided with doors. The mattress has slats across it to form the bottom of the bed, and suitable devices are provided for raising and lowering.

Mr. George W. Dudley, of Waynesborough, Va., has patented an improvement in reamers. The reamer is first made in the shape of a square in cross section and having the proper amount of taper, and grooves are then cut on one side of each of its corners, and the whole piece is then twisted to form a spiral cutting edge. In giving the twist the reamer is turned upon its longitudinal axis, so that its spirals wind in a reverse direction to the ordinary gimlet. This reamer cuts at all points in its circumference at the same time and makes a perfectly round hole, and will not choke, as it drives the cuttings before it.

A new mechanical musical instrument has been patented by Mr. George W. Van Dusen, of Brooklyn, N. Y. In the top of the air chamber of the instrument are two openings that lead into air passages that are closed alternately by a double valve. Openings in the air passages lead to two bellows that are connected by a rod, so that one will open and close when the other closes and opens. Reeds and reed valves are operated by perforated sheet music and by the air pressure. By this construction of the bellows and valves they are nearly balanced and their movements are prompt, and the music will be given with animation.

A novel device for holding the rolled curtains of carriages has been patented by Mr. William H. Weaver, of Emmettsburg, Md. A circular curved spring hook is swiveled upon the top rail of a carriage top, so that it can be turned to project from the rail when the curtain is raised, or be placed parallel with it when the curtain is lowered. If the curtain is to be raised it is rolled up in the usual manner, and the rolled curtain is held above the hooks, the free end of which is pulled outward to admit the curtain. When the hook is released its spring closes it, holding the curtain firmly.

A machine for making ditches for drain pipes has been patented by Mr. Francis Pidgeon, of Saugerties, N. Y. A platform supported on broad wheels carries at one end a device for raising and dropping a wide, heavy knife, in the same manner as the ramming block of a pile driver is raised and dropped. The knife cuts a narrow tapering trench, and the earth is not scooped out, but pressed to the sides. When a portion of the ditch equal to the width of the knife is completed, by suitably arranged devices the platform is moved in the line of the trench a distance equal to the width of the knife.

An improved glove and mitten fastening has recently been patented by Mr. William Gifford, of Schenectady, N. Y. Strips of metal are punched out in such shape that they may be hinged at one end, and their sides bent over to take hold upon, and cover the edges of the slit or opening at the wrist. A projection from the side of one of the strips has an aperture at its outer end, that is adapted to be hooked over a rivet attached to the opposite side, thus locking the device and fastening the glove. The fastening is strong, and protects the edges of the slit from being ripped when the glove is drawn on.

A saddle pad that can be attached to and detached from the saddle, and is not destroyed by the perspiration of the animal, has been patented by Francis A. Hake, of Cuero, Tex. The pad is formed of an upper and lower cover, made of waterproof material, and fitted between with layers of felt or woolen cloth, cut in the desired shape of the pad. The upper and lower covers are connected by lacing. The pads of each have pockets adapted to receive the front and rear projecting parts of the saddle tree side bars, and laces attached to the pads serve to secure them to the saddle tree.

An invention to prevent the escape of grounds when pouring coffee from coffee pots has been patented by Mr. John McAnespey, of Philadelphia, Pa. In the inside of the coffee pot is an upright, finely perforated in its upper part, and secured to the sides of the pot in such a position as to cover the hole leading to the spout. When the pot is inclined to pour out coffee the grounds are kept back, by the solid lower part of the plate, while the coffee passes through the perforations of the plate and out at the spout, free from grounds.

Mr. William E. Harris, of New York city, has patented improvements in the process of extracting gold from ores. The ore, after being roasted and chloridized, is then placed in amalgamating pans, and mixed with bromide of sodium in the proportion of two pounds of bromide to a ton of ore. Water and quicksilver are then added, to produce a proper amalgamation of the metal, and the amalgamator is run about three hours, and the pulp is discharged through separators. The bromide of sodium prevents the sulphates and chlorides from attacking the quicksilver.

Mr. William R. Fleming, of Newark, N. J., has patented improvements in "German student" lamps by which the movable reservoir of the lamp is dispensed with. The lamp is of the ordinary construction, except that the filling cup is left out, and the top of the reservoir is provided with an air-tight plug, and a stop-cock is placed in the tube that connects the reservoir and the lamp. The stop-cock is turned to close the tube when the lamp is filled. When the tube is opened the oil fills the burner to the top of the connecting tube, and as it is burned away below the edge of the tube, the vacuum in the oil reservoir causes a bubble of air to pass up the tube, and oil is let down again.

Mr. Monroe Ingraham, of Dadeville, Mo., has patented a reel for bolting purposes, in which the bars of the reel, instead of being supported by spokes from the shaft in the usual manner, are attached to heads, on which are flanged rims that roll on friction wheels for support, and are also driven by them. The interior space of a reel is free, and fans are fastened to the shaft, that are revolved in opposite direction to the reel for urging the meal from the center, to and through the bolting cloth, by gentle currents of air. By this construction the capacity of the bolt is largely increased.

An invention to facilitate the reversing of windows for cleaning them from the inside has been patented by Mr. Henry Becker, of New York city. The upper half of the window jambs are adapted to swing on pivots, and the lower sash is raised until it is within the swinging frame and is locked in this position. Both sashes are then inverted by turning the swinging frame half way over. By this means the outsides of the sashes are turned to the inside and they may be cleaned by a person inside the room, avoiding the danger from cleaning from the outside.

Mr. Alonzo Chappel, of Brooklyn, N. Y., has patented a combination easel, consisting of the easel, drawing board, portfolio, and drawers. The easel is hinged upon one edge of a shallow box and forms the cover of the box. This box forms the upper cross-piece of the easel frame, and under the box is a drawer divided into compartments for brushes and paints, and between the drawer and the lower cross-piece of the frame is a portfolio. Suitable devices for retaining the easel in position when raised are provided. The easel, when nicely constructed and finished, makes a nice piece of furniture for a drawing-room.

An apparatus in which the amalgamating of gold or silver ores is very easily effected has been patented by Mr. Walter Hamilton, of New York city. A basin of sufficient size to contain a large amount of melted lead, or metals capable of amalgamating gold or silver ores, is placed over the fire chamber of a furnace. At a suitable distance above this basin and furnace a similar basin and furnace is placed, and from an aperture in the upper basin a vertical pipe leans down to near the bottom of the lower basin. A funnel, suspended in the upper basin, discharges into the vertical pipe. From the hopper the pulverized ore is forced by feed screws into the funnel, and from the funnel into the lower basin. As the ore passes from the funnel it is mixed with the melted metal in the vertical pipe, and as it passes out at the end of the pipe a series of devices moves the ore about until every particle of the gold or silver comes in contact with the lead and is removed.

Mr. Gordon Dinsmoor, of Kirksville, Mo., has recently patented improvements in school desks. The improvement consists of a foot rest sliding in grooves in the desk frame, and connected with the front edge of the hinged seat, whereby the hinged seat and the foot rest are simultaneously raised and lowered. By this construction a foot rest is provided that cannot be removed by the janitor, and when the seat is raised is out of the way of the broom in sweeping.

ENGINEERING INVENTION.

An apparatus for removing sand bars from rivers and harbors has been patented by Mr. John H. Huffner, of Jacksonville, Ore. A stout flat-bottomed boat is provided for carrying the machinery, the boat being propelled by a stern wheel driven by an engine, and also has a hydraulic pump worked by the engine. A hydraulic tube, into which water is forced by the pump, is fitted to the bow of the boat, and reaches to the bottom of the river, and the sand or mud is removed by projecting a jet or number of jets of water against it.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Mr. J. W. Arnold, Garrison, Benton Co., Iowa, has purchased the entire patent of Cokely's Washing Machine, which was illustrated in the SCIENTIFIC AMERICAN of May 6, 1882, page 274. The illustration clearly represents the invention, and any one can see the many advantages possessed by this over all other washing machines. Many of the features are entirely novel. It is convenient, easily managed, easily operated, and readily and cheaply constructed. A paying thing to make or sell. For territory, either county or State rights, address as above.

A Great Bargain.—We have thoroughly examined the Evans Twenty-six Shot Breech-loading Rifle, and do not hesitate to say that, without exception, it is one of the best constructed, simplest, and most perfect breech-loading rifles for the price we have ever seen. Owing to the failure of the Evans Rifle Co., Messrs. E. G. Rideout & Co. have bought a large quantity of these Rifles at a price so low that they can be offered at the nominal figure of Fifteen Dollars, which is about one-half the cost of manufacture. Our business experience with Messrs. E. G. Rideout & Co. has been most satisfactory, so that we do not hesitate to place their advertisement before our readers, knowing all will be fairly and honorably dealt with.—*Chicago Express.*

American Fruit Drier. Free Pamphlet. See ad., p. 142.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Peck's Patent Drop Press. See adv., page .141

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

Paragon School Desk Extension Slides. See adv. p. 141.

Drop Forgings. Billings & Spencer Co. See adv., p. 141.

Brass & Copper in sheets, wire & blanks. See ad. p. 141.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Millstone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 64 Nassau street, New York.

Blind Wirers and Borers. B.C.Davis,Binghamton,N.Y.

Eagle Anvils, 10 cents per pound. Fully warranted.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p.141.

Lathes, Planers, Drills, with modern improvements. The Pratt & Whitney Co., Hartford, Conn.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 142.

Knives for Woodworking Machinery.Bookbinders, and Paper Mills. Taylor, Stiles & Co., Riegelsville, N. J.

The Sweetland Chuck. See illus. adv., p. 126.

Common Sense Dry Kiln. Adapted to drying of all material where kiln, etc., drying houses are used. See p.126.

Lightning Screw Plates, Labor-saving Tools. p. 126.

Engines, 10 to 50 horse power, complete, with governor, $250 to $350. Satisfaction guaranteed. Six hundred in use. For circular address Heald & Morris (Drawer 98), Baldwinsville, N. Y.

Mr. T. D. Lockling, care U. S. Consul, Panama, U. S. Colombia, will sell the whole or a portion of his patent for umbrellas, illustrated on p. 82, this volume.

Air Pumps for High Pressure, Hand, or Steam Power, at low prices. C. Beseler, 218 Center Street, New York.

Draughtsman's Sensitive Paper.T.H.McCollin,Phila.,Pa.

For Mill Mach'y & Mill Furnishing, see illus. adv. p.108.

See New American File Co.'s Advertisement, p. 110.

Steam Pumps. See adv. Smith, Valle & Co., p. 109.

Books for Engineers. Catalogues free. E. & F. N. Spon, 44 Murray Street, New York.

Bostwick's Giant Riding Saw Machine, adv., page 93.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 93.

Small articles in sheet or cast brass made on contract. Send models for estimates to H. C. Goodrich, 66 to 72 Ogden Place, Chicago, Ill.

Improved Skinner Portable Engines. Erie, Pa.

Combination Roll and Rubber Co., 68 Warren street, N. Y. Wringer Rolls and Moulded Goods Specialties.

Pure Water furnished Cities, Paper Mills, Laundries, Steam Boilers, etc., by the Multifold System of the Newark Filtering Co., 177 Commerce St., Newark, N. J.

"Abbe" Bolt Forging Machines and "Palmer" Power Hammers a specialty. Forsaith & Co., Manchester,N.H.

List 28, describing 3,600 new and second-hand Machines, now ready for distribution. Send stamp for same. S.C.Forsaith & Co.,Manchester,N.H.,and N.Y.city.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

First Class Engine Lathes, 20 inch swing, 8 foot bed, now ready. F. C. & A. E. Rowland, New Haven, Conn.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users & engineers. (Forward above by postal or letter; mention this paper.)

Steel Stamps and Pattern Letters. The best made. J. F. W. Dorman, 21 German St., Baltimore. Catalogue free.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N.J.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) "Objective" writes: I have a couple of good objectives which are blurred by the crystallization of the balsam or cement between the crown and flint sections. I don't know exactly what the cement may be; its color now is a pale straw, iridescent in reflected light. How can I separate and clean? A. The Canada balsam that is used for cementing the glasses of your objectives has shrunk. This sometimes occurs when glasses are cemented with balsam that is too thin. As the glasses are probably burnished in, it is a serious matter to take them out and reset them centrally unless you have the proper tools and are expert at that kind of work. If they are American objectives, write to the makers, they are the only proper persons to reset the glasses. Probably any good optician can reset the glasses for you. If you desire to try the job yourself, remove the lenses from the cell, put them in water at the atmospheric temperature, bring the water to a boil; then while the lenses are still hot separate them if you can. If you find this impossible, soak them in benzole or turpentine until they can be separated. Then clean the lenses thoroughly with turpentine first, then with alcohol. Finally, warm the lenses, put on each a drop of thick Canada balsam and press them together firmly. Wipe off the surplus balsam and tie a string around the lenses, or clamp them together in some other way, and allow the balsam to set before replacing the lenses in the cell.

(2) T. F. P. asks what kind of an attachment to put on a common turning lathe for turning round balls? A. As you do not state the kind of balls—wood or metal is not stated—we give the process for turning wooden balls and billiard balls. First, turn by a template or gauge or by caliper, as nearly spherical as possible. Then make a chuck of wood and fasten it to the mandrel in any way the most convenient. Turn out the chuck hollow so that the ball will enter nearly half a hemisphere. Chuck the ball at right angles to the position that it was first turned in. Turn off the outside or projecting part true by nearly obliterating the lines of the first turning, then rechuck and turn the other hemisphere. If great nicety is required, as in billiard balls, you will have to continue the chucking in several other positions and turn very carefully with curved tools. A little chalk in the chuck will help the ball to stick. If you have difficulty in holding the ball in, you may put a small false center against the ball made of iron, with a thin piece of leather waxed upon it to prevent scratching. If this is done nicely you may do the work without chucking the ball so deep. 2. What should be the diameter of an iron shaft 40 feet long to transmit twenty-five horse power? A. As you do not give the speed and weight of pulleys to be carried by this shaft, it can only be answered approximately. A shaft of 2⅛ inches diameter, with bearings 12 feet apart, running at 100 revolutions or over, with pulleys distributed along the line, would do the work. With less speed, or the whole power delivered at the end of the shaft, 40 feet from the source of power, then a 2¾ or 3 inch shaft is recommended, according to nature or requirements of machinery driven, whether steady or intermittent.

(3) G. W. A. asks: How much would it decrease the friction on a flat-bearing (engine crosshead) 6 inches by 8 inches, if I were to plane it so it would have a bearing of about 3 inches on each side? A. None. The bearing surface would wear away much more rapidly. The best practice is to have a very large surface.

(4) W. C. Y. writes: I wish to build an engine; are the following proportions so far correct? Diameter, 2 inches, length 3½ inches, thickness of cylinder ⅜ inch, steam ports ⅛x¾, exhaust ⅛x¾, distance between ports ¼ inch. If not correct, please inform me what the proportions should be, and also give me the proper diameter for piston-rod and width of piston for above engine, and what distance the piston should be from the cylinder heads when the shaft is at a dead center? What size boiler and how thick ought I to have for 200 pounds pressure? A. ¼ inch thick is sufficient for cylinder, make steam and exhaust openings 1⅛ inch length. Work piston within $\frac{1}{32}$ inch of heads. Make piston-rod ⅜ inch diameter. We cannot inform you about boiler, without knowing the number of revolutions per minute you intend to work.

(5) W. B. asks for recipe for cheap black paint for iron. A. A good cheap black paint or varnish for iron work is prepared as follows: Clear (solid) wood tar, 10 pounds; lamp black or mineral black, 1¼ pounds; oil of turpentine, 5½ quarts. The tar is first heated in a large iron pot to boiling (or nearly so) and the heat is continued for about four hours. The pot is then removed from fire out of doors, and while still warm (not hot) the turpentine mixed with the black is stirred in. If the varnish is too thick to dry quickly, add more turpentine. Benzine can be used instead of turpentine, but the results are not so good. Asphaltum is preferable to the cheap tar.

(6) Referring to the dynamo-electric machine described in SUPPLEMENT, No. 161, A C. D. asks: 1. Could not the magnets be cast together and then omit putting the brass plate under them; if not, what is the reason for using brass to connect them instead of iron? A. Iron would close the magnetic circuit, so that the magnet would have very little effect on the armature. 2. Could not the armature be made of soft wrought iron as well as cast? A. It might be made of wrought iron if homogeneous metal could be obtained. 3. Is there no substitute for the vulcanite cylinder used in the commutator; if so, what is one that is more easily procured? A. Hard wood or bone may be used. 4. What is cotton factory cloth? A. It is ordinary white cotton cloth.

(7) R. L. McI. asks: 1. Would there be much loss by evaporation in keeping kerosene in a closely made and painted barrel, in a perfectly dry cellar? A. If the barrels are well painted the loss will be very slight. 2. Can you tell me what causes the sputtering heard in the receiver of a telephone? Sometimes I find it almost impossible to understand what is said. A. It is due to the influence of induction from the earth or from neighboring wire. Atmospheric electricity also sometimes causes it. 3. Please give me a receipt for nickel plating? A. You will find receipts and directions for nickel plating in SUPPLEMENT, No. 310.

(8) A. T. S. asks: What progress, if any, has been made toward photography in natural colors; and are there any complete theories or processes extant for its accomplishment? A. See "Photography in Natural Colors," in SUPPLEMENTS, Nos. 175 and 216. We know of no other late comprehensive treatise on the subject.

(9) W. T. writes: Please state in the columns of the SCIENTIFIC AMERICAN what a mogul engine is? Some say they are ten-wheelers with six drivers, and others say they are ten-wheelers with eight drivers. Which is correct? And, if neither, what is? A. Eight-wheelers with six drivers. Ten-wheelers with eight drivers are called "consolidation engines." There are ten-wheelers with six drivers and a four-wheel truck.

(10) H. W. B. asks: Will you please describe some good and cheap method by which I can filter water for a laboratory? A. See answer to W. H. K., page 75 (11), current volume.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

August 8, 1882,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Advertising device, F. S. Newby ... 262,240
Advertising device, automatic, O. S. Trussell ... 262,515
Air forcing apparatus, W. Q. Prewitt ... 262,472
Alarm. See Burglar alarm. Door alarm.
Anchor, R. R. Spedden ... 262,254
Animal tie, E. C. Newton ... 262,306
Apple corer and slicer, L. Toser ... 262,332
Arithmetical frame, J. Gould ... 262,221
Bale tie, wire, L. E. Evans (r) ... 10,176
Baling press, J. J. Stopple ... 262,496
Balls, manufacture of base, T. P. Taylor ... 262,257
Bar. See Header bar.
Barrels, device for rolling, R. H. Dowling ... 262,530
Bed bottom, spring, P. H. Mellon ... 262,302
Bed bottom, spring, S. H. Reeves (r) ... 10,179
Bedstead, folding spring, E. J. Johnson ... 262,431
Bell, team, A. A. Bevin ... 262,358
Bench. See Wash bench.
Berth, sleeping car, H. A. Stone ... 262,329
Billiard table, R. Herman ... 262,410
Blind, inside window, A. C. & W. W. Gibson ... 262,399
Board. See Ironing board.
Bobbin builder for yarn-winding machines, etc., C. E. Bean ... 262,349
Boiler. See Steam boiler.
Boiler covering, H. W. Johns ... 262,429
Bolt. See King bolt. Meal bolt.
Boot and shoe heel, revolving, H. J. Johnson ... 262,430
Boot or shoe, L. E. Moore ... 262,239
Bottle envelope, H. Bell ... 262,353
Bottle wrapping, carpet lining, etc., J. H. McLean, 262,462
Bottling machine, M. L. Severy ... 262,324
Box. See Fare box. Match box. Paper box.
Box nailing machine, F. Myers ... 262,304, 262,305
Box trimming machine, Casey & Stevens ... 262,370
Brake. See Vehicle brake Wagon brake.
Brake mechanism, J. C. Glass ... 262,401
Bucket, dinner, Ets & Theis ... 262,282
Buggy, F. & M. D. Doherty ... 262,381
Buggy, E. C. Hildebrand ... 262,411
Building, fireproof, P. G. Hubert ... 262,415
Building, fireproof, J. J. Schillinger ... 262,483, 262,484
Burglar alarm and door bell, electric, J. P. Freeman ... 262,398
Burial casket, A. W. Taylor ... 262,508
Button, G. Felsenthal ... 262,213
Button, E. H. Royce *et al.* ... 262,480
Button, W. Steed ... 262,498
Buttons, ornamenting, O. Barthels ... 262,347
Cabinet, writer's, W. H. Rearden ... 262,312
Canister, J. H. Tingman ... 262,259
Car brake, Dawley & Spaulding ... 262,378
Car coupling, W. Deets ... 262,536
Car coupling, L. Grannan ... 262,289
Car coupling, W. E. Grisham ... 262,722
Car coupling, J. J. Kennedy ... 262,433
Car coupling, M. J. McCrone ... 262,449
Car coupling, C. M. Rhodes ... 262,315
Car coupling, W. H. Swinford ... 262,501
Car coupling, H. D. Thorp ... 262,509
Car coupling, P. Zehner ... 262,550
Car coupling tool, Barrett & Ross ... 262,346
Car, freight, E. McManus ... 262,454
Car starter, E. A. Jarvis ... 262,230
Car starter, R. C. Smith ... 262,251
Cars, dust protector for railway, W. A. Boyden ... 262,274
Carpet cleaner, M. Beltmiller ... 262,352
Carpet cleaning machine, J. Zacherl ... 262,550
Carpet stretcher, H. O. Detert ... 262,380
Carriage, child's, W. C. Lewis ... 262,545
Cartridge shells, box for packing, A. A. Reed ... 262,313
Cattle tie, C. M. & L. Baker ... 262,345
Cement, gas-proof, W. M. Jackson ... 262,427
Chair. See Reclining chair.
Chair, Heywood & Taft ... 262,543
Chair foot rest, M. M. Copp ... 262,278
Chandelier, electrical extension, S. Bergmann ... 262,272
Cheese boxes, machine for reducing the height of, N. N. & F. J. Fairchild ... 262,387
Chopper. See Cotton chopper.
Chuck for centering and securing pulleys to shafts, J. Emerson ... 262,211
Clamp, A. Kraiss ... 262,233
Clay and clay shale pulverizer or disintegrator, J. C. Anderson ... 262,340
Clay for bricks, tiles, etc., coloring, J. C. Anderson ... 262,339
Cleaner. See Carpet cleaner.
Clip. See Vehicle clip.
Cocoanut, prepared, Stow & Overbaugh ... 262,497
Coffee roaster, G. Fisher ... 262,390
Colter, rotary, A. J. Manny ... 262,446
Cooking apparatus, gas, E. D. Lyons ... 262,444
Corset, nursing, C. N. Chadwick ... 262,371
Cot, folding, J. S. Burton ... 262,275
Cotton chopper, W. O. Rains ... 262,474
Coupling. See Car coupling. Pipe coupling. Thill coupling. Whiffletree coupling.
Cranial perforator, S. Slater ... 262,489
Cultivator, W. Scott ... 262,487
Curtain fixture, P. E. Gérard ... 262,398
Curtain rod joint, A. H. Moore ... 262,458
Cutter. See Pipe cutter.
Digging machine, land, Crossby & Carey ... 262,377
Disk cutter holder, rotary, A. McDonald ... 262,237
Door alarm, C. A. Smith ... 262,490
Door lock sliding, E. A. Gauchet ... 262,397
Earthenware vessels, machine for turning, J. W. Denmead ... 262,281
Easel, Cameron & Long ... 262,205
Edge trimmer and burnisher, D. F. Hallahan ... 262,224
Electric illuminator, incandescent, J. H. Irwin ... 262,418
Electric machine, dynamo, J. H. Irwin ... 262,421
Electric machine, dynamo, J. A. Jenney ... 262,544
Electric signaling apparatus, H. W. Southworth ... 262,252
Electrical armature, J. J. Wood ... 262,529
Electrical conductors, conduit for, S. D. Strohm ... 262,499
Electrical generators, cooling device for, J. H. Irwin ... 262,422
Elevator. See Hydraulic elevator.
Elevator, H. Graves ... 262,291
Embroidering machine, J. Ebneter ... 262,383
Engine. See Pumping engine.
Excavating machinery, S. Craig ... 262,535
Extractor. See Staple extractor.
Eyelet embossing machine, S. Sternberger ... 262,494
Fan flue, D. M. Bliss ... 262,360
Fare box, Alexander & Boyle ... 262,267
Farm gate, A. & A. Ishe ... 262,425
Fats for culinary uses, preparing animal, S. H. Cochran ... 262,207
Fence wire, barbed, C. G. Bodman ... 262,200
Fertilizer distributer, J. Strayer ... 262,498
Fifth wheel, F. L. Ezell ... 262,396
Firearm, breech-loading, A. E. Whitmore ... 262,521
Fire balloon, G. A. Lilliendahl ... 262,235
Fire escape, H. Keenan ... 262,297
Fire escape, H. D. Wilson ... 262,337
Fires on railway trains, extinguishing, A. M. Granger ... 262,288
Fish trap, J. Otter ... 262,464
Flower pot, G. A. Wagner ... 262,335
Folding table, W. H. Carr ... 262,206
Frame. See Arithmetical frame. Pocketbook frame.
Fruit jar, F. H. Perry ... 262,244
Furnace. See Heating furnace. Hydrocarbon furnace. Portable furnace. Smoke consuming furnace.
Furnace for heating metal bars, S. F. Reynolds ... 262,477
Furrow opener, G. W. Nutter ... 262,461
Gas and electric light fixture, combined, S. Bergmann ... 262,271
Gas apparatus, hydrocarbon, T. J. Brough ... 262,363
Gas apparatus, hydrocarbon, E. Merts ... 262,455
Gas by electricity, apparatus for lighting, J. P. Tirrell ... 262,360
Gate. See Farm gate. Railway gate.
Generator. See Steam generator.
Glass and glassware, manufacture of ornamental, T. D. Farrall ... 262,388
Glass, oven and roll for flattening, Stevenson & Wilson ... 262,495
Glove, C. F. A. Koehler ... 262,434
Gloves, shoes, etc, fastening for, S. Florsheim ... 262,215
Governor, steam engine, C. H. Corliss ... 262,209
Grain binder, G. H. Spaulding ... 262,492
Grain, etc., device for conveying, G. Crehore ... 262,376
Grain elevator, stop mechanism, J. A. McLennan, 262,453
Grain, process of and apparatus for cleaning, W. L. Teter ... 262,504, 262,505
Grapple, R. Stone ... 262,330
Guard. See Window guard.
Hammer, T. Partlan ... 262,468
Handle. See Saw handle.
Harrow, S. Davis ... 262,280

Harrow, J. Maunder 262,448
Harrow, M. P. Mighell 262,456
Harrow, F. Nishwitz 262,307, 262,308
Harrow teeth, die for pointing and sharpening, J. Hershek 262,294
Hat brims, apparatus for shaping and curling, T. Rowbotham 262,479
Head lights, signal attachment for locomotive, W. H. Thiell 262,506
Heater. See Sad iron heater.
Header bar, G. B. Vroman 262,262
Heating furnace, hot air house, A. P. Benner ... 262,199
Headle and means for mounting the same, J. L. Lairdieson 262,436
Hide and pelt working machine, E. D. Warren 262,520
Hides, bating and tanning, M. Turley 262,516
Hinge, spring, W. Gilfillan 262,400
Hog sorting apparatus, R. W. Cole 262,373
Hoisting apparatus, J. Roughan 262,322
Holder. See Desk cutter holder. Oil-stone holder. Tether holder.
Hook. See Whiffletree hook.
Hydrant valve, J. Flower 262,216
Hydraulic elevator, A. Granville 262,290
Hydrocarbon furnace, Litchfield & Renshaw 262,236
Incubator, J. M. Halsted 262,407
Insulator, lightning arrester, and connector, combined, W. H. Eckert *et al.* 262,210
Ironing board, Tannenberg & Barnum 262,502
Ironing machine, H. E. Smith 262,491
Jack. See Lifting jack.
Jar. See Fruit jar.
Jewelers' stock, machine for ornamenting, J. W. Cameron 262,369
Joint. See Curtain rod joint. Railway rail joint.
King bolt, H. McFarlane 262,451
Knitting machine, I. W. Lamb 262,299
Knitting machine, J. A. Parr 262,467
Knitting machine pattern wheel, J. A. Parr 262,466
Knitting machines, stop motion device for, J. Bramley 262,202
Lamp, electric arc, R. A. Johnston 262,296
Lamp, electric arc, C. J. Van Depoele 262,333
Lamp, incandescent electric, J. H. Irwin 262,420
Lamp safety device, electric, J. H. Irwin 262,423
Lamp support, incandescent electric, J. H. Irwin, 262,424
Lamp switch, incandescent, C. G. Perkins 262,470
Lard press, J. S. Ford 262,284
Last, absorbent, T. J. Foster 262,217
Latch, J. Gérard 262,219
Latch, E. Parker 262,243
Latch, gate, W. A. Hawkins 262,409
Lifting jack, W. S. Burgin 262,204
Lifting jack, N. P. Walters 262,519
Lock. See Door lock. Seat lock.
Locomotive ash pan, J. Ritchie 262,318
Locomotive safety bridge, W. B. Wood 262,548
Loom reed, M. Ashe 262,197
Lubricating loose wheels and pulleys, device for, L. R. Faught 262,212
Machine table, E. A. Rowley 262,323
Match box and candlestick, combined, W. Trotter, Jr 262,514
Match box and safe, C. W. Chamberlin 262,372
Mattress or bed bottom, spring, W. Bulkeley 262,365, 262,366
Meal bolt, R. Wilson 262,527
Measure, liquid, C. Riesaner 262,317
Mechanical movement, J. C. Richardson 262,478
Milk cooling apparatus, J. Roberts 262,320
Mining machine, coal, J. W. Harrison 262,225
Mop head and wringer, combined, J. G. Mosmy 262,303
Mortar and plaster, Arrouquier & Barrett 262,343
Neuralgia, compound for treatment of, H. F. Mills 262,457
Oar lock, J. Vincent 262,334
Oil stone holder, C. T. Howard 262,414
Pad. See Truss pad.
Padlock, permutation, R. D. Green 262,406
Pan. See Locomotive ash pan.
Paper box, knockdown, P. E. Bowe 262,201
Piano music rack, H. Behning 262,351
Picture exhibitor, A. Lueckel (r) 10,178
Picture exhibitor and portfolio, combined, H. T. Thomas 262,507
Pipe coupling, waste, L. B. Ohliger 262,310
Pipe cutter, J. Conway 262,534
Pipe cutter, C. C. Walworth 262,264
Pipe wrench, C. C. Walworth 262,263
Pitcher spout cover or guard, detachable, O. T. Bedell 262,350
Planter check lines, reeling and unreeling corn, G. D. Haworth 262,226
Planter, corn, Lindsay & Miner 262,439
Planter, corn, S. H. Williams 262,336
Plow, F. P. Hoke 262,413
Plow, J. A. Peek 262,469
Plow, ditching, J. L. House 262,229
Plow, etc., sulky, W. B. Packard 262,465
Plows, power lift for, Smith & Lockwood 262,547
Pocketbook frame, S. Scheuer 262,492
Pole, vehicle, C. C. Bradley 262,362
Portable furnace to facilitate the means of firing decorated china, glass, etc., E. M. Ford 262,391
Pot. See Flower pot.
Press. See Baling press. Lard press.
Printing, inking apparatus for block, J. Hutchison 262,416
Pulley, J. Mallen 262,445
Pulverizing machine, L. C. Springer 262,327
Pump, D. N. B. Coffin 262,208
Pump, W. N. Cosgrove 262,279
Pump, force, G. J. Fritz 262,394
Pump for steam boilers, feed, J. Houpt (r) 10,177
Pump, oil, E. G. Felthousen 262,389
Pump, steam, J. Henshall 262,293
Pumps and other devices, actuating mechanism for, J. P. Wilson 262,338
Pumping engine, W. D. Hooker 262,223
Pumping engine, vertical, H. F. Gaskill 262,286
Purse, Schrader & Stahl 262,486
Pyrotechnic signal, E. F. Linton 262,440
Pyrotechnic trail, E. F. Linton 262,442
Rack. See Piano music rack.
Rail fastening or chair, G. Gray 262,404
Railway gate, P. Hauseman 262,292
Railway rail joint, F. Lightfoot 262,438
Railway rail, tubular, J. Elmer 262,384
Railway signals, magneto-generator for, W. W. Gary 262,396
Reamer, adjustable, G. A. Bates 262,345
Receptacle for storing and transporting substances, W. Kowalevsky 262,232
Reclining chair, E. Ortlepp 262,311
Roaster. See Coffee roaster.
Rolls, machine for surfacing, W. N. Cosgrove 262,375
Roof seat for shingling, W. P. Thomson 262,508
Sad iron heater, P. McDonald 262,450
Sash cord fastener, W. Goforth 262,220
Saw handle, E. Andrews 262,341
Saw shafts, bearing for circular, G. H. Zschech 262,551
Sawing machine, drag, T. F. Osburn 262,463
Scale cover, E. Toutant 262,512
Scraper and cultivator, combined, D. Hardy 262,408
Scraper, road, W. G. Beyerly 262,359
Screw machine, metal, S. H. & C. F. Roper 262,321
Sealing and unsealing freight cars and the like, device for, J. C. Richardson 262,316
Seat. See Roof seat.
Seat lock, F. A. Havens 262,541
Secondary batteries, making elements for, C. F. Brush 262,533
Seeder and fertilizer distributor, combined, B. Kuhns 262,435
Seeding machine, J. C. Mundel 262,460
Sewing machine, C. H. Bayley 262,269
Sewing machine, L. H. Davis 262,536
Sewing machine, W. Koch 262,298
Sewing machine, A. Lambert 262,437
Sewing machine, W. Redett 262,245
Sewing machine, belt, M. Gandy 262,395
Sewing machine, book, D. M. Smyth 262,325, 262,326
Sewing machine presser foot, C. H. Bayley 262,270
Sewing machine stand, A. M. Leslie 262,300
Sewing machine stand, D. Sweeney 262,500
Sewing machine tension, A. Spear 262,253
Sewing machine, throat plate for boot and shoe, F. Bean 262,198
Shingle, metallic roofing, E. B. Repp 262,475
Shoe last, E. C. Wright 262,266
Shot cabinet, A. F. Fleming 262,214
Shutter fastener, Ritz & Gärtner 262,319
Shutter, fireproof, C. Berrian 262,356
Sifter, cinder, Wilson & Hallam 262,526
Signal. See Pyrotechnic signal.
Sign, electrical, J. H. Irwin 262,417
Skid for supporting barrels, A. A. Clark 262,277
Slates, manufacturing, R. G. Winslow 262,528
Smoke consuming furnace, H. Jerome 262,428
Snow from railway cuts, machine for removing, W. Deetz 262,537
Soda from the spent liquors of pulp mill digesters, apparatus for reclaiming, W. L. Longley 262,443
Sole fastening wire, L. Goddu 262,287
Spike, W. H. Bailey 262,344
Spindle bearing, G. H. Allen 262,268
Spinning jacks and mules, mechanism for reversing the rotation of the spindles of, Wiggin & Greenhalgh 262,523
Spoke setting machine, A. M. Fisher 262,283
Spooling machines, driving cylinder for yarn, J. K. Brown 262,203
Stand. See Sewing machine stand.
Staple extractor, H. A. Hess 262,542
Steam boiler, tubular, G. H. Rheutan 262,247
Steam generator, F. W. Foster 262,392
Swing, G. W. Mason 262,447
Switch. See Lamp switch. Telephone switch.
Table. See Billiard table. Folding table. Machine table.
Target, flying, A. Woeber 262,265
Telegraph, duplex, G. S. Mott 262,459
Telegraphic fire alarm apparatus, A. C. & A. H. Palmer 262,242
Telegraphy, visual, J. H. Irwin 262,419
Telephone desk, E. W. Salisbury 262,248
Telephone, electric, J. P. Freeman 262,285
Telephone exchange system, F. O. Vaille 262,261
Telephone exchanges, transferring and calling implement for, L. Mann 262,301
Telephone switch, Bartlett & Waite 262,532
Tether holder, J. D. Wilson 262,525
Thill coupling, Revoir & Thomson 262,314
Thill coupling, A. J. & E. G. Sawyer 262,249
Thrashing machine separator shoe, H. M. Green 262,405
Tickets, machine for issuing and recording, J. H. Betteley 262,357
Tie. See Animal tie. Bale tie. Cattle tie.
Tin plate, crystallizing, F. Rudolph 262,481
Tire unsetter, J. Raible 262,473
Tongue support, Tiffin & Smith 262,510
Top spinning, J. O. Benecke 262,354
Torpedo exploder, J. S. Schoonover 262,485
Toy, Unz & Hendrie 262,517
Toy balloon, E. F. Linton 262,441
Toy savings bank, J. H. Bowen 262,361
Trace splice, H. L. Sutherland 262,255
Trap. See Fish trap.
Treadle, A. R. Bushnell 262,368
Treadle, H. Reese 262,246
Trimmer. See Edge trimmer.
Truck, car, R. E. Ismond 262,426
Trundle wheel, J. T. Brown 262,364
Truss pad, J. S. Starson 262,328
Tunnel, buoyant and subaqueous, J. T. Williams, 262,524
Tunnels and arches, constructing underground, J. C. Goodridge, Jr 262,403
Tunnels, culverts, etc., construction and repair of, J. C. Goodridge, Jr 262,402
Turning tool, pin, A. Geiger 262,216
Twine balling machine, L. J. Hirt 262,412
Umbrella or parasol covers, machine for cutting material for, E. Wickstead 262,522
Urinal, J. P. Hyde 262,295
Valve. See Hydrant valve.
Valve gear, compound engine, E. Reynolds 262,476
Valve, steam actuated, W. D. Hooker 262,227
Valve, steam piston, W. S. Phelps 262,471
Vehicle, I. O. Endicott 262,385
Vehicle brake, D. Shelton 262,488
Vehicle clip, F. Lightfoot 262,546
Vehicle, side bar, J. Schmedinghoff 262,250
Vehicle, two-wheeled, J. A. Bilz 262,273
Veneer cutting machine, R. H. Thompson 262,256
Ventilator, T. Minchin 262,238
Wagon brake, automatic, Ogle & Turnure 262,309
Wall paper, machine for pasting and hanging, C. W. Doyle 262,382
Walls with flock, coating, J. H. Campbell 262,276
Wash bench, L. J. Lewis 262,234
Washer. See Window washer.
Watch and clock dial, J. J. D. Trenor 262,513
Water closet, T. H. Walker 262,518
Water closet attachment, Barron & Raimes 262,531
Water elevator for wells, J. C. & C. H. Tise 262,511
Water waste detector trap, W. E. Worthen 262,549
Water wheel, turbine, R. H. Armstrong 262,342
Watering device for pot plants, automatic, E. K. Dean 262,379
Weaving machine for covering bottles, S. Oakman 262,241
Weigher and register, grain, C. J. M. Bereuter 262,355
Well point and strainer, drive, O. B. Olmsted 262,462
Wheel. See Fifth wheel. Knitting machine pattern wheel. Trundle wheel. Water wheel.
Whiffletree coupling, F. A. Havens 262,540
Whiffletree hook, W. E. Grisham 262,223
Whip, M. M. Copp 262,374
Whisky, making, E. H. Taylor, Jr 262,256
Window, M. B. Burk 262,367
Window guard or screen, portable, W. P. Todd 262,331
Window washer, G. A. Keene 262,331
Wrench. See Pipe wrench.
Yoke, neck, A. Kanzler 262,482

DESIGNS.

Bracket, C. C. Cox 13,169
Cake or biscuit, F. G Cass 13,140
Calendar, T. E. Whalen 13,168
Carpet, J. Beaser 13,137, 13,138
Carpet, C. A. Righter ..... 13,163 to 13,167
Card, fancy, S. Garre 13,170
Charm for watch chains, etc., H. G. Mackinney 13,157
Clock case, H. J. Davies 13,142
Clock case, F. H. Hotchkiss 13,171
Coffin handle support, W. R. McComas 13,158
Coffin ornament, W. R. McComas 13,159
Glassware, F. S. Shirley 13,160
Hat lining, stamped, F. L. Petrini 13,162
Printed fabric, J. Glen 13,145, 13,146
Sponge basket, W. B. & G. W. Burk 13,139
Spoon and fork handle, F. Dimier 13,143
Spoon or fork handle, L. C. Hiller 13,136
Toy money box, Kyser & Rex 13,144
Toy shovel, I. P. Chalfant 13,141
Type, printing, C. Müller 13,161
Wall paper, E. Leissner ..... 13,147 to 13,156

TRADE MARKS.

Beer, lager, Berliner Brauerei-Gesellschaft Tivoli 9,590
Beer, lager beer, ale, and porter, D. G. Yuengling, Jr 9,598
Brandy, Renauld & Niederstadt 9,594
Cotton goods, Boott Cotton Mills ..... 9,599 to 9,601
Crackers, A. L. Bauman 9,588
Hose, G. P. Dodge 9,602
Medical compounds, certain, H. H. Warner 9,597
Milk and for raising cream, vessel or apparatus for cooling, Vermont Farm Machine Company 9,596
Pianos, J. Church & Co 9,591
Pickaxes, hatchets, axes, and hammers, H. H. Trenor 9,595
Preserving compound, Preservaline Manufacturing Company 9,598
Trusses, Bartlett & Butman 9,589
Wine, sherry, T. Osborne 9,592

English Patents Issued to Americans.

From August 1, 1882, to August 4, 1882, inclusive.

Battery, secondary, C. Cuttries, Duxbury, Mass.
Bobbin frame for looms, R. S. Cookson, Philadelphia, Pa.
Cigarette machine, Cowman Cigarette Machine Company New York city.
Distillation, apparatus for, H. Warts, New York city.
Dynamo-electric machine, H. C. Sample *et al.*, Camden, N. J.
Embroidery apparatus, F. H. Chilton, New York city.
Fire-damp, method of indicating, J. Kitsee, Cincinnati, O.
Finger ring, R. J. La Grange, Philadelphia, Pa.
Flour dressing machine, G. T. Smith, Jackson, Mich.
Gate, sliding, J. S. Sherwin, Battle Creek, Mich.
Intestines, machine for cleaning, S. Oppenheimer, New York city.
Lamp burner, H. W. Hayden, Waterbury, Conn.
Lock for safes, H. F. Newbury, Brooklyn, N. Y.
Loom, S. J. Knowles, Massachusetts.
Saw filing machine, C. W. Elkins *et al.*, Matteawan, N. Y.
Savings bank, toy, J. H. Bowen, Philadelphia, Pa.
Slide valve, balanced, J. J. De Lancey, Binghamton, N. Y.
Weft stop motion for looms (2), S. J. Knowles, Massachusetts.

A $40.00 TWENTY-SIX SHOT SPORTING RIFLE FOR ONLY $15.00

GREATEST BARGAIN EVER OFFERED.

THE EVANS TWENTY-SIX SHOT MAGAZINE SPORTING RIFLE.

SHOOTS 26 SHOTS IN 60 SECONDS WITHOUT REMOVING FROM THE SHOULDER.

No hammer in the way. Throwing down the guard ejects the shell, loads and cocks. Having sold through our advertisement a short time ago over 2000 Rifles, we now offer the **balance of 1500 for $15 each. THIS IS POSITIVELY YOUR LAST CHANCE** to get one of these **magnificent Rifles. THE EVANS is without exception the most accurate, longest ranged, easiest loaded, quickest fired, best constructed and most perfect repeating Rifle** in the world. It is **44 Calibre, centre fire, ENGRAVED BLACK WALNUT STOCK** and sighted with **graduated sights up to 1200 yards,** at which distance it is more accurate than any Rifle in the world. The magazine contains 26 shots, and is located in the stock as shown in cut No. 2. The working parts are all steel of the finest quality, case hardened and blued. Owing to the failure of the **EVANS RIFLE CO.** who spent over $200,000 in perfecting this Rifle, we were enabled to purchase their whole stock of over $50,000 worth of perfect Rifles at one-third the actual cost of manufacture. The price of these Rifles has always been **$40 each,** and when this lot is sold they cannot be purchased again at any price. **Order now,** you cannot make a mistake, as you can readily sell it for **$30 to $40. TAKE NOTICE,** upon receipt of $15 we will send one **Evans** Twenty-six Shot **Sporting Rifle,** 22 inch barrel, as above described, carefully boxed, and when full amount of cash comes with the order we will send a box of reloadable metallic cartridges. Or sent C. O. D., privilege of examination, upon receipt of $3, or your Express Agent's guarantee that it will be returned to us free of express charges in case you do not take it, but we do not send the cartridges when sent C. O. D., as this is extra inducement to those who send cash with order. We also have a few hundred **elegant 28 inch** barrel Rifles at $17 each, and a few 28 inch octagon barrels at $20 each. This last-named Rifle formerly sold for $60, and is the most beautiful and accurate weapon in the world. **Send Money by P.O. Order or Registered Letter at our Risk.** Price of Reloading Tools for reloading shells $4.00, former price $6.00. Cartridges $2.50 per 100. **EVANS Cartridges** can be reloaded many times. **Every Rifle guaranteed perfect or money refunded. UNSOLICITED TESTIMONIALS!** "The Evans has been my constant companion for two years. I have shot 60 Buffaloes at one run."—**Kit Karson, Jr.** "I have used the Evans in competition with the Sharp, Winchester, and Ballard, it beats them all."—J. Frank Locke, Burnamsville, Minn. "It shoots like a house a fire! I can clean out a whole band of Indians alone with it. I shall recommend them wherever I go."—**Texas Jack.** "It is the Strongest Shooting Gun I ever put to my shoulder, and as for accuracy it can't be beat. I know it to be the best Rifle in the market."—J. A. Boyd, of Yates' Sharp Shooters. **We will forfeit $500 if this Rifle is not as represented.**

TAKE NOTICE. This target was made with the Evans shooting off-hand at 200 yards at Creedmoor, Sept. 17th. The whole 26 shots being fired inside of one minute, and without removing the Rifle from the shoulder. Of course much finer shooting could be done by taking time. As to our responsibility we refer to any Mercantile Agency, Express Co. or reputable business house in this city. **CUT THIS ADVERTISEMENT OUT, IT WILL NOT APPEAR AGAIN.** Address **E. G. RIDEOUT & CO.,** 10 Barclay Street, New York.

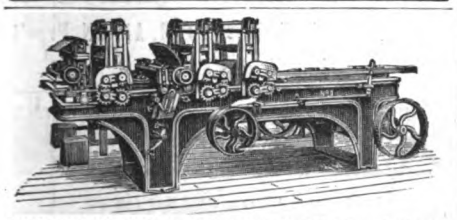
CINCINNATI BRASS WORKS — TRADE MARK STANDARD — GLOBE VALVE PATENT GLASS CUPS — ALL WORK FIRST CLASS

F. LUNKENHEIMER, PROP.

WOOD-WORKING MACHINERY.

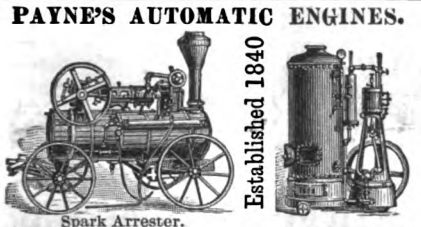
Universal Wood Workers, Planing, Matching, Moulding, Band and Scroll Sawing Machines, etc.

BENTEL, MARCEDANT & CO.,
HAMILTON, OHIO, U. S. A.



WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

PAYNE'S AUTOMATIC ENGINES.



Spark Arrester.

Reliable, durable, and economical, *will furnish a horse power with one-third less fuel and water than any other engine built* not fitted with an automatic cut-off. Send for Illustrated Catalogue "A" 2, for information and prices. **B. W. PAYNE & SONS,** Box 1207. Corning, N. Y.

TELEPHONE SEND FOR NEW CIRCULAR FITCHBURG ACOUSTIC TEL. Co. FITCHBURG MASS NEW METALLIC TELEPHONE

INVENTIONS WANTED, BY A RESPONSIBLE PERson, to introduce into Europe. Apply T. H. ASBURY, Enterprise M'f'g Co., Philadelphia, Pa.

BIBB'S
Celebrated Original
BALTIMORE
FIRE-PLACE HEATERS
To warm upper and lower rooms. The handsomest, most economical Coal Stoves in the world.
B. C. BIBB & SON
Foundry, Office and Salesrooms, 39 and 41 Light Street,
Baltimore, Md.
MARBLEIZED SLATE MANTELS.
☞ *Send for Circulars.*

SAWS How to straighten and gum all kinds. Address A. E. WILBUR, Schenevus, Otsego Co., N. Y.

MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS FINE TINNING JAPANNING AND FINISHING. THOMAS DEVLIN & CO. LEHIGH AVE. & AMERICAN ST. PHILA.

Chamfering, Howeling, and Crozing.

BARREL, KEG, HOGSHEAD, AND Stave Machinery.

Fan and Stave Jointer.

Over 50 varieties manufactured by
E. & B. HOLMES,
Buffalo, N. Y.

Truss Hoop Driving.

Head Rounding.

KEMP'S MANURE SPREADER,

PULVERIZER and CART COMBINED.

Greatest Agricultural invention of the age. Saves 50 per cent. of labor, and doubles the value of the manure. Spreads evenly all kinds of manure broadcast or in drill, in one-tenth the time required by hand.

Send for Illustrated Catalogue and full particulars to
KEMP & BURPEE M'F'G CO., Syracuse, Onondago Co., N. Y.

WAGON BRAKE LOCKS.—Send for my illustrated circular of the best Lock yet patented. Mailed free. E. H. JOHNSTON, Nashville, Tenn.

$88 A week to Agents. **$10 OUTFIT FREE.** RIDEOUT & CO., 10 BARCLAY ST., New York.

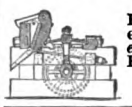
LARGEST ESTABLISHMENT OF THE KIND IN THE WORLD. — MOSS NEW PROCESS 535 PEARL ST. — SUPERIOR TO ANY OTHER METHOD.

MOSS ENGRAVING COMPANY

ENGRAVINGS FOR BOOKS, NEWSPAPERS CATALOGUES & C. — NEW YORK — SEND GREEN STAMP FOR ILLUSTRATED CIRCULAR. — THIRTEEN YEARS PRACTICAL EXPERIENCE.

"BLAKE'S CHALLENGE" ROCK BREAKER.

Patented November 18, 1879.



For Macadam Road making, Ballasting of **Railroads,** Crushing **Ores,** use of **Iron Furnaces,** etc. Rapidly superseding our *older styles* of Blake Crusher on account of its superior *strength, efficiency,* and *simplicity.* Adopted by important Railway and Mining Corporations, Cities, and Towns. First Class Medals of *Superiority* awarded by American Institute, 1879 and 1880.

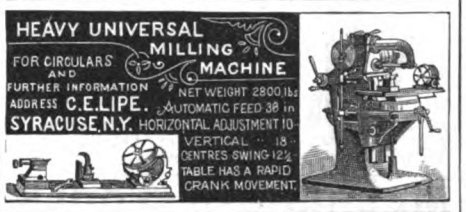
BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.

DON'T BUILD A HOUSE OF ANY KIND UNTIL YOU write for prices and sample to the BODINE ROOFING COMPANY, Mansfield, Ohio.

HEAVY UNIVERSAL MILLING MACHINE

FOR CIRCULARS AND FURTHER INFORMATION ADDRESS C.E.LIPE. SYRACUSE, N.Y.

NET WEIGHT 2800 lbs. AUTOMATIC FEED 36 in. HORIZONTAL ADJUSTMENT 10 in. VERTICAL " 18 in. CENTRES SWING 12½ TABLE HAS A RAPID CRANK MOVEMENT.



MACHINERY

of every description. 121 Chambers and 103 Reade Sts., New York. THE GEORGE PLACE MACHINERY AGENCY.

DAMPER REGULATORS and Gage Cocks. Murrill & Keizer, Baltimore.

BEATTY'S ORGANS, 27 stops, **$90.** Pianos, $297.50. Factory running day & night. Catalogue free. Address **Daniel F. Beatty, Washington, N. J.**

NUT TAPPING MACHINE.

DURRELL'S PATENT.

No. 1 Machine, 900 lb., 7 spindles.
" 2 " 1,050 " 7 "
" 2 " 600 " 3 "

Capacity of 7 Spindles, 8,000 per 10 hours.

Acknowledged to be an indispensable tool Manufactured by

HOWARD BROS.,
Fredonia, N. Y.

$72 A WEEK. $12 a day at home easily made. Costly outfit free. Address TRUE & Co., Augusta, Me.

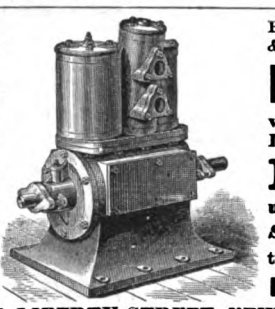
Send for Circular & Price List of

COPE & MAXWELL M'F'G CO'S
New and Improved Styles of
STEAM PUMPS
—AND—
BOILER FEEDERS.
"THE BEST MADE."
Address HAMILTON, OHIO.

GEORGE WESTINGHOUSE, JR., *President.* RALPH BAGALEY, *& Treas.* H. H. WESTINGHOUSE, *Superintendent.*

The Westinghouse Machine Company

Will make Special Contracts with Manufacturers of High Speed Machinery, to DRIVE DIRECT with



THE WESTING HOUSE ENGINE

Without the use of Belts.

CORRESPONDENCE SOLICITED.

Send for illustrated circular to

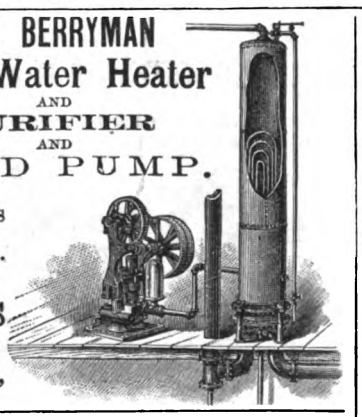
The Westinghouse Machine Company,

Works at Pittsburg, Pa. **92 & 94 LIBERTY STREET, NEW YORK.**

THE BERRYMAN Feed Water Heater AND PURIFIER AND FEED PUMP.

THE I. B. DAVIS PATENT, MAY, 1879.

M'f'd by **I. B. DAVIS & SON,** HARTFORD, CONN.



WATCHMAKERS.

Before buying lathes, see the "Whitcomb," made by AMERICAN WATCH TOOL CO., Waltham, Mass.

SEND TO LONDON, BERRY & ORTON PHILA PA FOR

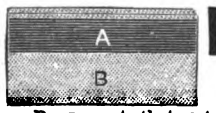
THE BEST BAND SAW BLADE

To Electro-Platers.

BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with Books of Instruction for Gold, Silver, or Nickel Plating. THOMAS HALL, Manufacturing Electrician, 19 Broomfield Street, Boston, Mass. Illustrated Catalogue sent free.

Cheap Small Boilers. T. McDonough, Montclair, N. J.

FOR HEAVY PUNCHES, SHEARS, Boiler Shop Rolls, Radial Drills, Etc.
SEND TO
HILLES & JONES
WILMINGTON, DEL.



RUBBER BACK SQUARE PACKING.

BEST IN THE WORLD.

For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.

B represents that part of the packing which, when in use, is in contact with the Piston Rod.

A, the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.

This Packing is made in lengths of about 20 feet, and of all sizes from ¼ to 2 inches square.

JOHN H. CHEEVER, Treas. **NEW YORK BELTING & PACKING CO.,** 29 Park Row, New York.

SPECIAL NOTICE.—Owing to the recent great fire in the "World" Building, our office has been removed as above.

WIRE ROPE: THE HAZARD MANUFACTURING CO. CHARLES PARRISH PRESIDENT.

MANUFACTURERS OF

WIRE ROPE, BRIDGE CABLES, SHIP RIGGING,

Tramway Ropes, Champion Barbed Wire, etc.

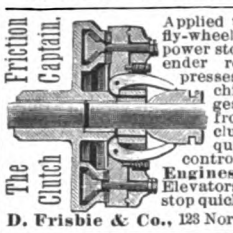
Office and Works: WILKESBARRE, PA. Send for price list. **Office and Warehouse: 87 LIBERTY ST., NEW YORK.**

ROOT'S NEW IRON BLOWER.

POSITIVE BLAST.

IRON REVOLVERS, PERFECTLY BALANCED,
Has Fewer Parts than any other Blower.
P. H. & F. M. ROOTS, Manufacturers,
CONNERSVILLE, IND.
S. S. TOWNSEND, Gen. Agt., 6 Cortland St., 8 Dey St.,
COOKE & CO., Selling Agts., 6 Cortland Street,
JAS. BEGGS & CO., Selling Agts. 8 Dey Street,
NEW YORK.
SEND FOR PRICED CATALOGUE.

Friction Captain. The Clutch



Applied to all machinery driven by fly-wheels and liable to be broken by power stored in wheels, such as calender rolls, upsetting machines, presses, and wire drawing machines. We warrant to save gearing and all machinery from breaking by using our clutches. Starts gradual, stops quick. Any amount of power controlled. **Friction Hoisting Engines and Drums;** also, Safety Elevators. Can be run faster and stop quicker than any other friction.

D. Frisbie & Co., 123 North 4th St., Philadelphia, Pa.

SPEAKING TELEPHONES.

THE AMERICAN BELL TELEPHONE COMPANY,

W. H. FORBES, *President.* W. R. DRIVER, *Treasurer.* THEO. N. VAIL, *Gen. Manager.*

Alexander Graham Bell's patent of March 7, 1876, owned by this company, covers every form of apparatus, including Microphones or Carbon Telephones, in which the voice of the speaker causes electric undulations corresponding to the words spoken, and which articulations produce similar articulate sounds at the receiver. The Commissioner of Patents and the U. S. Circuit Court have decided this to be the true meaning of his claim; the validity of the patent has been sustained in the Circuit on final hearing in a contested case, and many injunctions and final decrees have been obtained on them.

This company also owns and controls all the other telephonic inventions of Bell, Edison, Berliner, Gray, Blake, Phelps, Watson, and others.

(Descriptive catalogues forwarded on application.)

Telephones for Private Line, Club, and Social systems can be procured directly or through the authorized agents of the company.

All telephones obtained except from this company, or its authorized licensees, are infringements, and the makers, sellers, and users will be proceeded against.

Information furnished upon application.

Address all communications to the
AMERICAN BELL TELEPHONE COMPANY,
95 Milk Street, Boston, Mass.

ALL KINDS OF WOOD WORKING MACHINERY IRON WORKING TOOLS & SPECIAL TOOLS, THE MANUFACTURED BY H.B. SMITH MACHINE Co. SMITHVILLE, BUR. CO. N. J. CIRCULARS FREE.

FOR SALE!
One 80 Horse Power Root's Sectional Safety Boiler.
J. A. FAY & CO., Cincinnati, O.

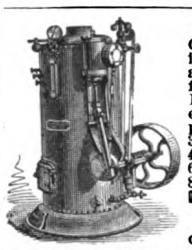
GOLD PENS.

PENCILS, HOLDERS, CASES, &c.

The CALLI-GRAPHIC Pen.

A GOLD PEN and RUBBER HOLDER, containing ink for several days' writing. Can be carried in the pocket. Always ready for use. A luxury for persons who care to preserve their individuality in writing.

MABIE, TODD & BARD,
180 BROADWAY, NEW YORK.
Send for Price-List.
OUR GOODS ARE SOLD BY FIRST-CLASS DEALERS.



BOOKWALTER ENGINE.

Compact. Substantial. Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, etc., at the low price of

3	HORSE POWER.....	$240 00
4½	" "	280 00
6½	" "	355 00
8½	" "	440 00

☞ Put on cars at Springfield, O.
JAMES LEFFEL & CO.,
Springfield, Ohio,
or 110 Liberty St., New York.

RUPTURE

cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 251 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.

NEW YORK STENCIL WORKS

STEEL LETTER STAMPS STEEL DIES, &C.

87 NASSAU ST. N.Y.

PENNSYLVANIA STATE COLLEGE.
Open to both Sexes. Undenominational. Located in one of the most beautiful and healthful spots in the Allegheny region. TUITION FREE. Board and other expenses very low. Courses of study: Classical, Scientific (general), and Technical, with a Classical and Scientific Preparatory Department. Fall term opens August 25, 1882. For catalogues or any information, address
GEO. W. ATHERTON, President,
State College, Center Co., Pa.

A PRACTICAL SUCCESS.
VAN DUZEN'S PAT. LOOSE PULLEY OILER.
Thousands in satisfactory everyday use. Entire reliability and constancy demonstrated in a two years' test by (would be) Eastern skeptics. Economy shown by reasonable prices and perfect performance. Send for our "Catalogue No. 55."
VAN DUZEN & TIFT, Cincinnati, O.

Patent Right on Klinkerfues' New Weather Compass for Sale. Apply to BIERNATZKI & CO., Hamburg, Germany.

DESCRIPTIVE CIRCULARS SENT ON APPLICATION TO HALL & SONS JOHNSTON ST. BUFFALO N.Y.

SPRAY FEED WATER PURIFIER FOR STEAM BOILERS U.S. & FOREIGN PATENTS

$5 to $20 per day at home. Samples worth $5 free. Address STINSON & Co., Portland, Me.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

COLUMBIA Bicycles.

Thousands in daily use by doctors, lawyers, ministers, editors, merchants, etc., etc. Send 3c. stamp for elegantly illustrated 36 page catalogue to

THE POPE M'F'G CO.,
647 Washington Street, Boston, Mass.

RUTGERS COLLEGE.

[Chartered as "Queen's College" in 1770.]
New Brunswick, N. J. 1 hour from New York on Pa. R. R.
Year begins (examinations for admission) Sept. 20, 1882.

A thoroughly equipped College. **Seventeen successful professors; no inexperienced tutors.** Requirements for admission, those of the best New England colleges. Classical course, full and thorough. Honors in the intercollegiate contests. Best methods. Full illustrative collections of coins, photographs, plans, etc. Ample provision for **electives, with prescribed work,** in Junior and Senior years.

SCIENTIFIC DEPARTMENT.
The New Jersey State College to Promote Agriculture and the Mechanic Arts.

A practical Scientific School of high grade. Two courses. "Engineering and Mechanics" and "Agriculture and Chemistry"—including in addition to Mathematics, pure and applied, and the Natural Sciences, the careful study of English Literature and Composition, French, German, History, Metaphysics, and Political Economy.

Thorough work with constant field-practice in Engineering and Surveying. Careful laboratory work in Chemistry, with full apparatus for each student.

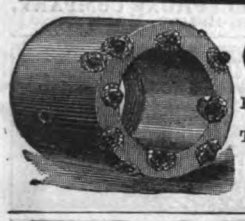
State Agricultural Experiment Station and College Farm of 100 acres in successful operation under direction of **Professor George H. Cook, LL.D., Vice-President,** illustrate to students the theory and economic practice of farming.

Tuition reasonable. **Forty State Scholarships free;** eight of them now vacant, to be filled before September 30. Full information in catalogue.

Almost without exception graduates who desired occupation have at once obtained profitable positions in professional scientific work, while others have found their interest in the successful practice of improved and scientific farming. For catalogue, or any information, address *Secretary Rutgers College.*

MERRILL EDWARDS GATES, Ph.D., LL.D., President.

Diamonds and Carbon



For all kinds of Mechanical Purposes.

Carbon for Mining Drills

A SPECIALTY.

Best quality at the lowest price.

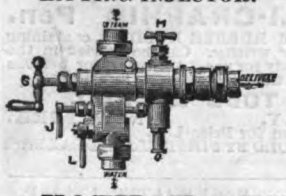
The Oldest Established House in the U. S.

J. DICKINSON,
64 Nassau Street,
NEW YORK.

ROOFING.

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 32 John Street, New York.

The "MONITOR."
A NEW LIFTING AND NON-LIFTING INJECTOR.



Best Boiler Feeder in the world. Greatest Range yet obtained. Does not Break under Sudden Changes of Steam Pressure.

Also Patent EJECTORS OR Water Elevators,
For Conveying Water and Liquid.
Patent Oilers, Lubricators, etc.

NATHAN & DREYFUS,
Send for catalogue. **92 & 94 Liberty St., New York.**

Horizontal Steam Engines,

For best Automatic Cut-off or Plain Slide Valve of Superior Design, Complete in Every Respect,
ADDRESS

LAMBERTVILLE IRON WORKS,
LAMBERTVILLE, N. J.

$66 a week in your own town. Terms and $5 outfit free. Address H. HALLETT & Co., Portland, Me.

SAWS 40,000 SAWS
EMERSON'S ILLUSTRATED SAWYERS HAND BOOKS (FREE) TO ANY PART OF THE WORLD.
FULL SIZE PLANER SAW TOOTH 5 CENTS EACH
ADDRESS EMERSON, SMITH & CO. BEAVER FALLS, PA

H. W. JOHNS' ASBESTOS

BUILDING FELT,

FOR LINING UNDER FLOORS, SHINGLES, WEATHER BOARDS, ETC.

STRICTLY FIREPROOF.

In rolls of 75 to 100 pounds each, 36 inches wide, two thicknesses, weighing 10 and 15 pounds to 100 square feet.

H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York.

Sole Manufacturers of H. W. Johns' Genuine

ASBESTOS ROOFING, STEAM PACKING, BOILER COVERINGS, PAINTS, ETC.

Special prices to large consumers. Send for sample.

SHAFTS PULLEYS HANGERS

At Low Prices. Large Assorted Stock.
A. & F. BROWN, 43 Park Place, New York.

SUPPLIES FROM HYDRANT PRESSURE the cheapest power known. Invaluable for blowing Church Organs, running Printing Presses, *Sewing Machines in Households,* Turning Lathes, Scroll Saws, Grindstones, Coffee Mills, Sausage Machines, Feed Cutters, *Electric Lights,* Elevators, etc. It needs little room, no firing up, fuel, ashes, repairs, engineer, explosion, or delay, no extra insurance, no coal bills. Is noiseless, neat, compact, steady; will work at any pressure of water above 15 lb.; at 40 lb. pressure has 4-horse power, and capacity up to 10-horse power. Prices from $15 to $300. Send for circular to

THE BACKUS WATER MOTOR CO., Newark, N. J.

SPECTACLES *Thermometers, Opera Glasses, Microscopes, Barometers, Telescopes,* and *Compasses.* **R. & J. BECK,**
Manufacturing Opticians, **Philadelphia, Pa.**
Send for Illustrated Priced Catalogue.

GOLD MEDAL, PARIS, 1878.
BAKER'S
Breakfast Cocoa.

Warranted ***absolutely pure Cocoa,*** from which the excess of Oil has been removed. It has *three times the strength* of Cocoa mixed with Starch, Arrowroot or Sugar, and is therefore far more economical. It is delicious, nourishing, strengthening, easily digested, and admirably adapted for invalids as well as for persons in health.

Sold by Grocers everywhere.

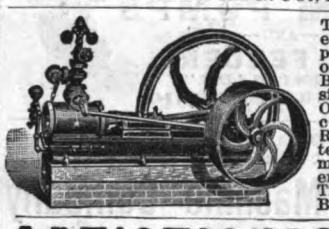
W. BAKER & CO., Dorchester, Mass.

THE BEST THE QUEBER WATCH CASE

WM. A. HARRIS,
PROVIDENCE, R. I. (PARK STREET),
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE
With Harris' Patented Improvements, from 10 to 1,000 H. P.

PATENT QUICK
Adjustable Stroke
SHAPERS
Can be Changed while in Motion.
E. GOULD & EBERHARDT,
NEWARK, N. J.

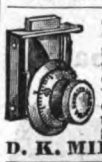
Stevens' Roller Mills,
FOR
GRADUAL REDUCTION OF GRAIN.
Manufactured exclusively by
THE JOHN T. NOYE MFG. CO., Buffalo, N. Y.



THE STRONGEST, most complete, and *reliable* of Engines and Boilers. Special sizes, 4 to 40 H. P. Others on application. Also Rock Drills, Water Motors, and machinery generally. Geo. W. Tifft, Sons & Co., Buffalo, N. Y.

ARTISTIC HOMES.

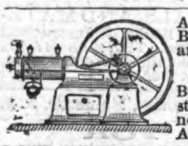
Just published. 44 Plans, Elevations, and Interiors of **QUEEN ANNE** and **COLONIAL Villas and Cottages,** costing from **$700** upward. Inclose **3c.** stamp for illustrated circular. Price **$3.50. Agents wanted.**
A. W. FULLER, Architect, Albany, N. Y.



STEMWINDING Permutation Lock, No. 125. This new style Dial Lock combines original features *not found in any other lock in the world,* rendering it invaluable to every person who wants security and convenience in using desk, drawer, or closet. 3c. stamp for illustrated price list of Locks, Padlocks, and Tills. Sample No. 125 mailed for $2.50.

D. K. MILLER LOCK CO., Philadelphia, Pa.

Steam Fitters' & Plumbers' Supplies.
STURTEVANT'S FAN BLOWERS.
JOHN S. URQUHART, Successor to
ALBERT BRIDGES, 46 Cortland Street, New York.

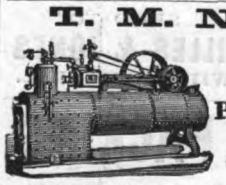


An engine that works without Boiler. Always ready to be started and to give at once full power.
SAFETY, ECONOMY CONVENIENCE.
Burns common Gas and Air. No steam, no coal, no ashes, no fires, no danger, no extra insurance. Almost no attendance.

THE NEW OTTO SILENT GAS ENGINE.

Useful for all work of small stationary steam engine. Built in sizes of **2, 4,** and **7** H. P., by **SCHLEICHER, SCHUMM & CO.,** N. E. cor. 33d & Walnut Sts., Phila., Pa. **A. C. Manning,** 38 Dey St., New York, Agent.

T. M. NAGLE,
ERIE, PA.,
Manufacturer of
Portable, Stationary,
AND
Agricultural
STEAM ENGINES.



MECHANICAL ENGINEERING.

To learn Inventing, Designing, and Construction of Machinery at school, address PROF. S. W. ROBINSON, Ohio State University, Columbus, O.

The Eclipse Engine

Furnishes steam power for all *Agricultural* purposes, *Driving Saw Mills,* and for every use where a first-class and economical Engine is required. Eleven first-class premiums awarded, including Centennial, '76. Refer to No. 7, issue of '77, No. 14, issue of '78, of SCIENTIFIC AMERICAN, for Editorial illustrations. FRICK & CO., Waynesboro, Franklin Co., Pa.

TOOPE'S PATENT
Asbestos Lined Removable Covering,

Made of Felt and Asbestos. For use on STEAM BOILERS and PIPES, Refrigerators, Meat Cars, Ice Houses, and HOT and COLD WATER PIPES. Easily applied by any one.
Address **CHALMERS-SPENCE CO.,**
23 John St., New York.

Double Screw Parallel, Leg Vises.

Made and WARRANTED *stronger* than any other Vise by **FISHER & NORRIS** only, **Trenton, N. J.**

SHEPARD'S CELEBRATED $60
Screw Cutting Foot Lathe.

Foot and Power Lathes, Drill Presses, Scrolls, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, "**Sun Light**" **Gas Machines,** etc. Send for catalogue of outfits for amateurs or artisans. Address

H. L. SHEPARD & CO.,
341 & 343 West Front St. **Cincinnati, O.**

ERICSSON'S
New Caloric Pumping Engine
FOR
DWELLINGS AND COUNTRY SEATS.

Simplest, cheapest, and most economical pumping engine for domestic purposes. Any servant girl can operate. Absolutely safe. Send for circulars and price lists.

DELAMATER IRON WORKS
C. H. DELAMATER & CO., Proprietors,
No. 10 Cortlandt Street, New York, N. Y.

JENKINS PATENT PACKING
THE STANDARD
MAKES A PERFECT JOINT
JENKINS BROS. 71 JOHN ST. NY.

THE J. L. MOTT IRON WORKS,
88 and 90 Beekman St., New York.

Demarest's Patent Water Closets used almost exclusively in all fine work. **Demarest's** Water Closets, Latrine's and Hopper's for public buildings and factories. **Mott's Celebrated Porcelain Lined Baths** unequaled for beauty and cleanliness. **Sanitary Goods** of all kinds.

This cut represents the renowned **RED JACKET Adjustable Double-acting Lift and Force Pump for general purposes.**

Highest Prizes awarded wherever **exhibited.**

Thousands now in use throughout the States, giving perfect satisfaction.

Fitted for hand and power. Agents wanted everywhere. For particulars, address

CINCINNATI PUMP CO.,
Cincinnati, Ohio, U. S. A.

MACHINISTS' TOOLS.
NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.
Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

PROSPECTING MINERAL LANDS A SPECIALITY.
CYLINDRICAL SECTIONS OR CORES OBTAINED THE WHOLE DISTANCE BORED. ARTESIAN WELLS BORED ROUND AND STRAIGHT ADMITTING A LARGER PUMP AND CASING IN PROPORTION TO SIZE OF HOLE THAN BY ANY OTHER PROCESS.
ESTIMATES GIVEN AND CONTRACTS MADE BY THE PENNSYLVANIA DIAMOND DRILL CO.
BOX 423 POTTSVILLE PA.
MANFTRS. OF DIAMOND DRILLS FOR ALL KINDS OF ROCK BORING.

THE PORTER-ALLEN
High Speed Steam Engine.
ADDRESS
SOUTHWARK FOUNDRY & MACHINE CO.,
430 Washington Ave., Philadelphia, Pa.

SWEEPSTAKES, WITH THE ELLIS Patent Journal Box. The best Planer and Matcher ever made. Planing 20 in. wide, 6 in. thick, weight 2,200 lb., $300; planing 24 in. wide, 6 in. thick, weight 2,600 lb., $350. Beading, Arbor, and Head, extra, $20. Sash, Door, and Blind Machinery a specialty. Correspondence solicited. Rowley & Hermance, Williamsport, Pa.

CLARK'S RUBBER WHEELS.
This Wheel is unrivaled for durability, simplicity, and cheapness. Adapted for Warehouse and Platform Trucks, Scales, Heavy Casters, and all purposes for which Wheels are used. Circular and Price List free. GEO. P. CLARK, Windsor Locks, Ct.

THE DUPLEX INJECTOR.

The constantly increasing demand for this Boiler Feeder proves its superiority over other machines now in use. Send for illustrated circular and price list.
Manufactured by **JAMES JENKS, Detroit, Mich.**

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.
Wheels and Rope for conveying power long distances. Send for circular.

Engineering, Physics, Chemistry.
SWARTHMORE COLLEGE.

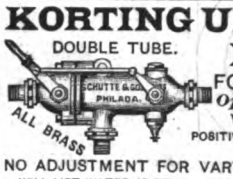
Thorough courses of study in *new buildings,* erected for the purpose, with *fully equipped workshops, laboratories, lecture* and *draughting* rooms, each planned with special reference to its intended use. Latest and best *apparatus, machinery, tools,* etc. Experienced and painstaking instructors. Usual degrees. Also Classical and Literary courses of study and a course for Teachers. Ten miles from Philadelphia by rail. Charges moderate. Care of Friends. For full particulars, address any of the Professors, or EDWARD H. MAGILL, A.M., *President,* SWARTHMORE COLLEGE, SWARTHMORE, Pa.

UPRIGHT DRILLS AN EXCLUSIVE SPECIALTY
SEND FOR ILLUSTRATED PRICE LIST **H. BICKFORD.** CINCINNATI, OHIO.

USE MACHINERY WIPERS.

Guaranteed to take up oil and dirt. $30 a thousand, including soap powder to wash them instantly when soiled.
BROWN M'F'G CO., 33 Central St., Providence, R. I.

KORTING UNIVERSAL INJECTOR



FOR BOILER FEEDING.
Operated by one handle.
WILL LIFT HOT WATER.
POSITIVE ACTION GUARANTEED UNDER ALL CONDITIONS.
NO ADJUSTMENT FOR VARYING STEAM PRESSURE.
WILL LIFT WATER 25 FEET. SEND FOR DESCRIPTIVE CIRCULAR.

OFFICES AND WAREROOMS:
PHILADA., 12TH & THOMPSON STS. | NEW YORK, 109 LIBERTY ST.
BOSTON, 7 OLIVER ST. | CHICAGO, 84 MARKET ST.
AUGUSTA, GA., 1026 FENWICK ST. | ST. LOUIS, MO., 709 MARKET ST.
DENVER, COL., 194 FIFTEENTH ST. | SAN FRANCISCO, 2 CALIFORNIA ST.
RICHMOND, VA., 1419 MAIN ST.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.

W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

ROCK DRILLS & AIR COMPRESSORS.
INGERSOLL ROCK DRILL CO.,
1 PARK PLACE NEW YORK.

"LAFARGE" PORTLAND CEMENT.
"BURHAM" English PORTLAND CEMENT.
"KEENE" CEMENT (Coarse and Superfine).
These celebrated makes of imported cements for sale by JAMES BRAND, 55 Beekman St., New York.

PROSPECTUS

OF THE

Scientific American

FOR 1882.

The Most Popular Scientific Paper in the World.

Only $3.20 a Year, including postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information, and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in the SCIENTIFIC AMERICAN a popular *resume* of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars and twenty cents** by the publishers; six months, $1.60; three months, $1.00.

Clubs.—One extra copy of the SCIENTIFIC AMERICAN will be supplied gratis *for every club of five subscribers* at $3.20 each; additional copies at same proportionate rate.

One copy of the SCIENTIFIC AMERICAN and one copy of the SCIENTIFIC AMERICAN SUPPLEMENT will be sent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of *seven dollars* by the publishers.

The safest way to remit is by Postal Order, Draft, or Express. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
261 Broadway, New York.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, one year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for one year. This includes postage, which we pay. Remit by postal order or draft to order of

MUNN & CO., 261 Broadway, New York.

PRINTING INKS.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts. Phila., and 47 Rose St., opp. Duane St., N. Y.