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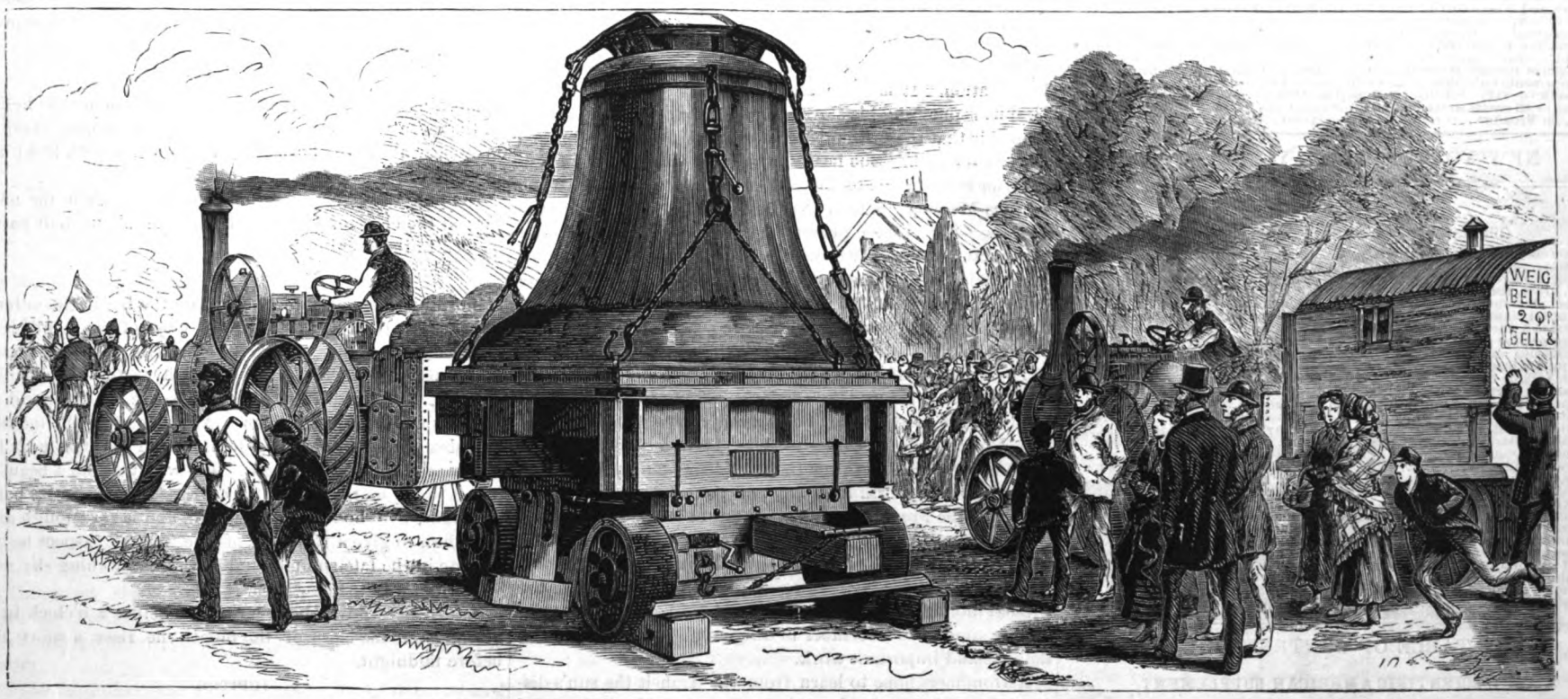
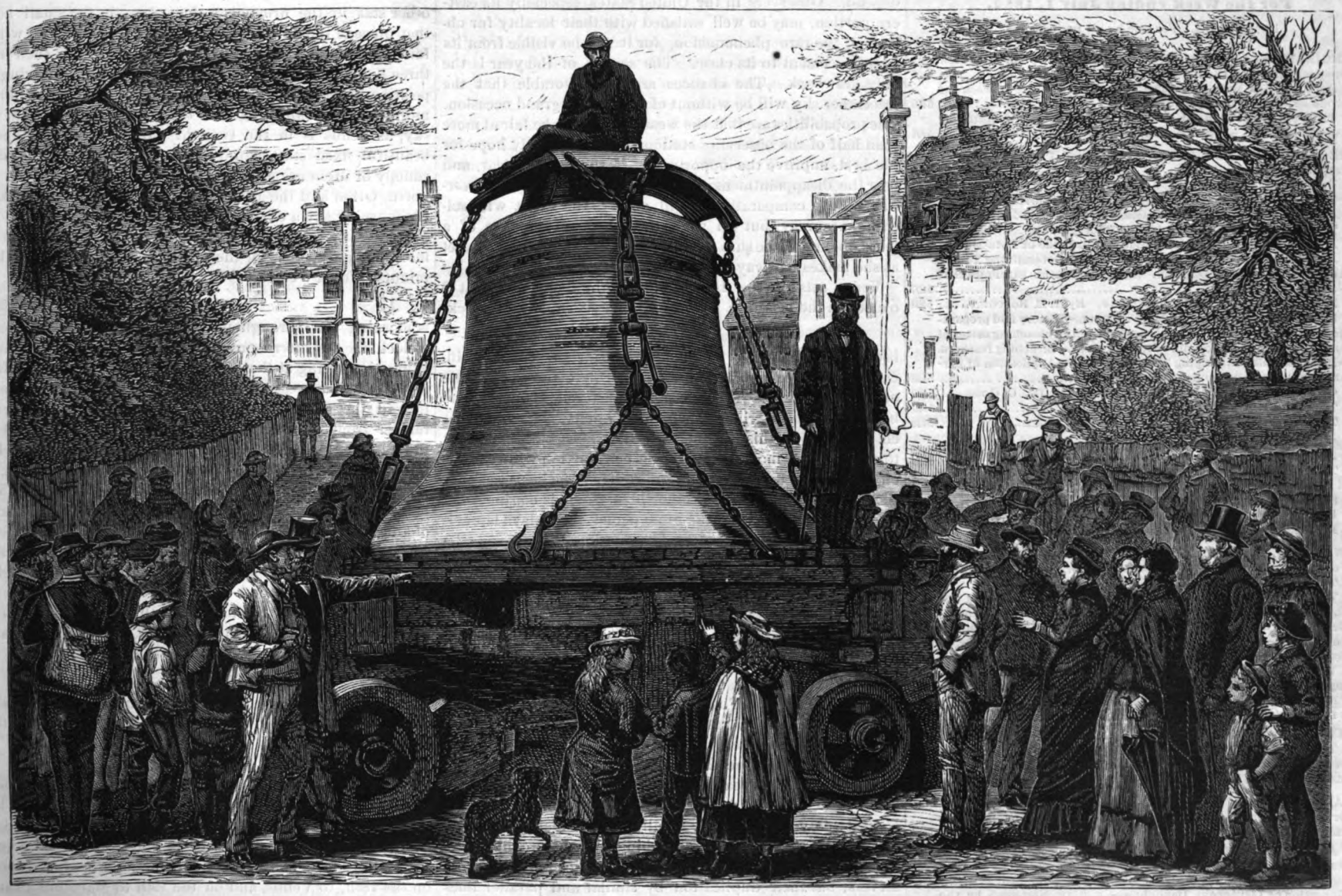
THE GREAT BELL FOR ST. PAUL'S.

The large bell manufactured by Messrs. Taylor, of Loughborough, Leicestershire, for St. Paul's Cathedral, arrived in London on Monday May 22, having been eleven days on the road, drawn by a traction-engine a hundred and fifteen miles. The contractors for the safe conveyance of this ponderous bell were Messrs. Coles & Matthews, of Coventry, who have performed their task with entire success. The bell weighs nearly seventeen tons, and stands above nine feet high, with a circumference of thirty feet at the rim. It was placed on a massive trolly, with low iron wheels of great width, the weight of the trolly and bell together being not less than twenty-two tons. A traction-engine took the heavily-laden carriage in tow; another engine drew a covered van, or hut on wheels, stored with jacks and engineers' tools of all kinds, for raising or repairing the trolly, in case of need. Attached to the rear of this traveling tool-house, which served also to shelter the men at night, was a cultivator, made for steam plowing, laden with boiler-plates, which could be laid down to assist in getting the wheels of the trolly over soft ground. Last of all, came a cask-shaped tank, to supply the two engines in traversing country where water might be scarce. The strange procession excited great curiosity and wonder in the rural districts of Northamptonshire, Bedfordshire, and Hertfordshire. In some places the local volunteers' band turned out. The bell was piloted along the road by Mr. R. Coles, riding on a tricycle, and accompanied by Mr. Taylor, with several London newspaper correspondents and others.

[*Continued on page* 6.]



THE BIG BELL FOR ST. PAUL'S—TRACTION ENGINES DRAWING THE BELL TO LONDON.



THE BIG BELL FOR ST. PAUL'S—A REST ON THE ROAD.

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Contents.

(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 889,

For the Week ending July 1, 1882.

Price 10 cents. For sale by all newsdealers.

ASPECTS OF THE PLANETS FOR JULY.

VENUS

is evening star, and leads the planetary brotherhood throughout the month in beauty, size, and brilliancy. She also plays an active role among her peers, contributing the largest share to the celestial phenomena of the month. No lover of the star-spangled heavens can behold unmoved her radiant presence in the western sky, or fail to feel that words are wanting to give expression to the surpassing grace with which she wields the scepter of the starry realm over which she reigns as acknowledged queen.

On the 14th, she is in conjunction with Alpha Leonis, or Regulus, the bright star near the ecliptic that often comes in the way of the passing planets, the same star that was still nearer Mars during the last month. Venus passes a little more than one degree north of Regulus. If the evening of the 14th be clear, no directions will be needed for observing the conjunction. The fairest of the stars will be recognized in the west at a glance, and Alpha Leonis will be seen shining with lesser glory about a degree, twice the diameter of the moon, to the south. Planet and star reach their nearest approach at 3 o'clock in the afternoon, but they will be sufficiently near in the evening to be worth watching.

On the 30th, Venus is in conjunction with Uranus, passing only seventeen minutes to the north. This is what is called a close conjunction, but as Uranus is invisible to the naked eye, and too near the sun for favorable observation in the telescope, the scene can only be viewed in the eye of imagination. It is none the less certain that the unseen Uranus is pursuing his slow course in the constellation Leo, than it is that the brilliant Venus will meet and pass him on her swifter path. She has been moving eastward since her superior conjunction on the 20th of February, and has passed in turn Mercury, Saturn, Neptune, Jupiter, and now passes Uranus. For as these planets were, near the time of their conjunction, moving westward and approaching the sun, it was inevitable that she should pass near them while moving eastward and receding from the sun. She will have but one more planet to pass before reaching her greatest eastern elongation on the 27th of September.

The attention of the whole scientific world is now concentrated on this beautiful planet on account of her transit on the 6th of December. Forty expeditions are already projected to observe it, and the eight French parties of observers start this month for the American stations they have chosen: four in north latitude, and four in south latitude. Thus far the French astronomers seem to be the most zealous in the cause. All the French parties have been practicing upon transit work for some time at the Paris Observatory. They will start for their different destinations early in the present month, and after their arrival will spend the intervening time until December in diligent preparation for their delicate and important work.

Astronomers hope to learn from the transit the sun's distance from the earth, for this is one of the best means of solving a problem on whose accuracy celestial measurements depend. Observers in the United States, especially its eastern portion, may be well satisfied with their locality for observing the rare phenomenon, for it will be visible from its commencement to its close. The season of the year is the only drawback. The chances are not favorable that the December sky will be without clouds on the grand occasion. The probabilities are that the weather will not be fair at more than half of the observing stations. We can only hope for the best, improve the opportunity if the sky be clear, and bear the disappointment philosophically if the sky be overcast. Few comparatively will observe the event with scientific accuracy, but all who can command the use of a telescope should be sure to get a glimpse of our sister planet as she makes her way over the sun's face.

Venus sets on the 1st of the month, about half past 9 o'clock in the evening; on the 31st, she sets about 9 o'clock.

MARS

is evening star during the month, but his present insignificant appearance poorly substantiates his claim to the title of the god of war. The year 1892 must roll round before he takes on the warlike aspect and intense fiery hue that entitle him to this distinction. There is but one event to notice in his monthly course, his conjunction with Uranus on the 27th, at 6 o'clock in the morning, when he passes only six minutes north of his brother planet. This conjunction, like that of Venus with the same planet three days later, is only visible to the eye of the imagination. The large telescopes will, however, show a great contrast in the delicate sea-green tint of Uranus and the ruddy hue of Mars as they hang side by side in the sky, seemingly so near, in reality so far apart.

Mars is brought prominently into notice on account of the remarkable markings observed on his disk by the noted observer, Schiaparelli, of Milan, during the oppositions of 1877 and 1879–80. These markings took on the form of long, narrow streaks, resembling canals, and were extensively distributed over the Martian surface. The same observer made still more marvelous discoveries at the beginning of the present year, soon after the opposition of 1881–82. He detected a duplication of the so-called canals in about twenty instances, the parallel lines actually unfolding themselves progressively, stretching out before his eyes. The long, narrow streaks have been noticed by other observers, but their duplication by similar and parallel lines is something entirely new. Schiaparelli is one of the most accurate observers of the age, and not likely to be mistaken in his observations. The next opposition of Mars, early in 1884, will find astronomers on the watch to seek for confirmation of these strange appearances. Results may then be reached that will greatly modify present views concerning the physical condition of a planet more essentially interesting to terrestrial observers than any other member of the system.

Mars sets now about seventeen minutes after 10 o'clock in the evening; at the end of the month, he sets about 9 o'clock.

URANUS

is evening star. We have already described the two events in his monthly progress, the conjunction with Mars on the 27th, the planets being six minutes apart, and the conjunction with Venus on the 30th, the planets being seventeen minutes apart. The three planets, Venus, Mars, and Uranus, are very near each other during the last week of the month. Mars first passes Uranus and Venus follows suit three days after. On the 27th, the right ascension, corresponding to terrestrial longitude, differs only a few minutes. The right ascension of Mars is 11h. 10m., of Uranus 11h. 10m., of Venus 10h. 58m. The declination, corresponding to terrestrial latitude, is: Mars 6° 13′, Uranus 6° 7′, and Venus 7° 44′ north.

Uranus sets on the 1st of the month about 11 o'clock in the evening; at the close of the month he sets a few minutes before 9 o'clock.

NEPTUNE

is morning star, and takes his place first among the heralds of the morn because he is the first of the shining company to appear above the horizon. His monthly path is without incident as far as regards his brother planets.

Neptune rises now about half-past 1 o'clock in the morning; at the close of the month he rises about half-past 11 o'clock in the evening.

SATURN

is morning star, and ranks second on the list in the order of rising. His right ascension at the close of the month is 3h. 32m., and his declination is 16° 53′ north. He may then be found nearer than he was last month to the two brilliant clusters, the Pleiades and the Hyades in Taurus, and still forming a triangle with them. At the end of the month it will also be easy to distinguish him from the stars near him by his serene and steady light. He will then be a beautiful object in the morning sky, for he rises a few minutes before midnight, five hours before the sun, and is far enough away from him to give a foretaste of the radiant aspect he will assume in the late summer and autumnal evening sky as he wends his way to opposition.

Saturn rises now about a quarter before 2 o'clock in the morning; at the close of the month he rises a short time before midnight.

JUPITER

is morning star, the third in the order of rising, but the first of the trio in brilliancy, surpassing in radiant loveliness every other star in the firmament that glows in the small hours that precede the dawn. At the end of the month he will be fair to see as he leads the heavenly host, for he then rises three hours before the sun. There is no need of giving his position in the heavens, for he is as readily recognized in the morning, as he shines against the dark background of the sky, as Venus is in the twilight glow. Some of the most beautiful fixed stars and groups that twinkle in the dark canopy of night are near him; the brilliant Capella on the north, Orion and the beaming Sirius on the south, making the morning sky a cluster of sparkling jewels.

Jupiter rises now a few minutes before 3 o'clock in the morning; at the close of the month he rises at twenty-three minutes after 1 o'clock.

MERCURY

is morning star throughout the month. On the 19th, at 6 o'clock in the afternoon, he reaches his greatest western elongation, being at that time 20° 13′ west of the sun. Here his oscillation westward ceases, and he begins to move toward the sun. Although he is often several degrees farther from the sun at one of his elongations than at the present one, his high northern declination, 21°, brings him into one of the most favorable positions of the year for observation as morning star. He may be found about an hour before sunrise on the 19th in the northeast, about a quarter of a degree north of the sunrise point, and 20° east of the sun. His position in right ascension is 22h. 19m., in declination 21° 1′ north. He may also be seen for a week before and after his elongation.

Mercury rises now not far from half-past 4 o'clock in the morning; at the close of the month he rises about a quarter before 4 o'clock.

THE MOON.

July displays on its records the advent of two full moons, the only month in the year honored with this distinction. The moon fulls on the 1st and again on the 30th. On the 10th the waning moon passes near Neptune and Saturn. On the 12th she passes a degree and a quarter north of Jupiter, making a lovely combination of a waning crescent and brilliant planet on the dark morning sky. On the 13th she is a little less than a degree south of Mercury, and will be a guide to his position. The three days' old moon pays her respects, on the 18th, to Venus, and on the 19th to Mars and Uranus. As she passes the trio of evening stars at a distance of about

six degrees there will be nothing interesting in her far-away greeting.

The moon just now is an important member of the solar family. Something new is promised in her monotonous story. The observers of the recent solar eclipse detected intimations of an atmosphere on her apparently lifeless surface. This is confirmation strong of some appearances on her disk that have never been accounted for and scarcely credited in scientific quarters. Only two days after the eclipse an observer, armed with forty years' experience, while looking at the moon saw, just over the westerly edge of the Mare Crisium, a peculiar cloud not less than a hundred miles long and forty or fifty miles wide, presenting a misty, feathery appearance, unmistakably different from the other portions of the lunar surface.

If this appearance was a reality, and not an optical illusion, other observers will probably detect something similar when the new moon comes round to the same position again. The face of our neighbor will be scrutinized as it never was before if there be the slightest prospect of overturning the old theories of lunar physics.

TELESCOPIC WORK.

The July field of labor for the amateur telescopist is not an extensive one. Jupiter, Saturn, and Mars are too far away to be favorable for observation. Venus still presents her gibbous phase, but is too near the sun for a satisfactory view. Mercury, until the 19th, takes on the form of a crescent. On the 19th his appearance is that of the moon at her first quarter. The rest of the month he presents the gibbous phase. It will require a powerful telescope to bring to view the sea-green disk of Uranus, but his delicate tint, in contrast with the ruddy hue of Mars, when, on the 27th, they are only six minutes apart, will be an interesting planetary study. Observations on the moon will receive a new impulse from recent events bearing upon her history.

The never-failing variety that characterizes the study of astronomy finds ample illustration on the July records. Three important themes demand the close attention of the student of the stars. The approaching transit of Venus comes first in importance. The busy notes of preparation for the event are sounding over the civilized world. Forty expeditions are beginning to carry out their plans. The eight French expeditions start for their stations during the month. All over the United States the observatories are being put in order, and the instruments are being prepared to do their best work, while the astronomers congratulate themselves that the transit has come to them, instead of obliging them to go to the transit.

The Martian canals, and the more marvelous observation of their duplication by progressive parallel lines, as seen by the keen-eyed Schiaparelli in the serene atmosphere, and under the cloudless sky of Milan, is another theme for study which may greatly influence the present theory of Martian physics.

In the third place, the moon comes in for a large share of attention. The French astronomers have discovered indications of an atmosphere, and unexplained appearances on her disk, before and since the eclipse, confirm the observations made at that auspicious hour.

Thus July furnishes astronomical studies of intense importance. The transit of Venus takes more tangible form as it draws nearer, the Martian markings are a wonder to the men of science, and the moon, apparently the abode of death, gives signs of life. Meantime the four morning stars sing together as they move in rhythmical harmony around the central source of life and light, and the three evening stars fulfill their course, the peerless Venus reigning supreme over her brother planets and the grand concourse of attendant stars.

IS THERE WATER ON THE MOON?

In a recent communication, Mr. Helmuth Dueberg, of Berlin, presents a new theory of the moon, and argues the possibility of its being inhabited on the further side.

It is well known that the moon always presents the same face to the earth. Because this side of the moon is an airless and waterless desert, we are not justified, Mr. Dueberg thinks, in assuming that the other side is like it.

Since the moon does not revolve so as to change the side presented to the earth, and since the attraction of the earth for the moon is very great, the heavier side, if there is any, must be turned this way. Supposing the moon to possess air and water, these lighter and more fluent elements of her composition would of necessity lie on the further side.

In the absence of any centrifugal force due to rotation on her own axis, the only centrifugal force acting upon the moon must be that resulting from the moon's motion round the earth. This would tend still more to throw the moon's air and water to the "out"-side with respect to the earth. For a practical illustration of this view, Mr. Dueberg suggests a ball swinging in a circle by means of a cord. The ball, like the moon, will always turn the same side to the center of revolution; and if it be dipped in any liquid, the liquid will be rapidly accumulated on the opposite or outer side. Hence the possibility of water, air, and life on the moon, around the shores of a central lunar sea, on the side always turned away from us.

RUSSIAN PETROLEUM PIPE LINE.—The petroleum pipe constructed from the Couban oil territory over the Caucasus Mountains to Novoroszisk Harbor, on the Black Sea coast, was opened May 27. It is 105 miles long, with a daily capacity to deliver 80,000 puds (about 1,000,000 lb.) of petroleum.

John Scott Russell.

John Scott Russell, Vice-President of the British Institution of Civil Engineers and the Institution of Naval Architects, is dead. He was born in the Vale of Clyde, in 1808. On leaving college he adopted the profession of engineering, and in course of time became manager of one of the largest shipbuilding and engineering establishments in Scotland. He removed to London in 1844, where he constructed several large steamships.

As a ship builder he was led to investigate the laws by which water opposes resistance to the motion of floating bodies, and he established the existence of the "wave of translation," on which he founded his "wave system" of construction of ships, introduced into practice in 1835. A paper bearing on this subject was read before the British Association in 1835, and for some years he continued his experiments, which amounted to the almost incredible number of 20,000.

The first vessel constructed on his "wave principle" was the Wave, in 1835, which was followed by the Scott Russell, in 1836, and the Flambeau and Fire King, in 1839, all of which proved successful. Mr. Scott Russell's principle was adopted by Mr. Brunel in designing the Great Britain, and it has steadily made its way both in this country and in the United States, and was carried out in the Great Eastern, the latest triumph of Mr. Scott Russell's genius. A memoir on the laws by which water opposes resistance to the motion of floating bodies was read by Mr. Scott Russell before the Royal Society of Edinburgh in 1837, and obtained for him the large gold medal, and he was elected a fellow and placed on the council of the society. Ten years later he was elected Fellow of the Royal Society of London and member of the Institution of Civil Engineers, of which he was a vice-president; had long been an active member of the British Association; was a member of the Society of Arts, and was for some time its secretary. He was one of the three original promoters of the Great Exhibition of 1851, who, under the direction of Prince Albert, planned and organized the preliminary arrangements, and, in conjunction with Sir Stafford Northcote, was joint secretary of the royal commissioners for carrying out the Exhibition. He was one of the founders of the Institution of Naval Architects, and was one of its vice-presidents, and had contributed many important papers to its Transactions. He completed a large and costly treatise entitled "The Modern System of Naval Architecture for Commerce and War," which comprehends the theory of naval design, the practice of ship building in iron and in wood, the principles of steam navigation, and is illustrated with 150 engravings, containing the finest works of modern shipbuilders and engineers.

Erastus W. Smith.

In the death of Erastus W. Smith New York loses one of its most prominent mechanical engineers. Many of the largest engines in the country are from his designs. Those of the Bristol and the Providence, of the Fall River Line, and of the Massachusetts and the Rhode Island, of the Providence, are among the latest. That of the Rhode Island was the last one he designed.

Mr. Smith was at the time of his death engineer-in-chief of the Providence Line, and a trustee of the Brooklyn Bridge. Among the public works in which he was engaged at different times are the iron bridge across the Harlem River and the waterworks at New Orleans and Chicago. The honorary degree of Doctor in Physical Arts was conferred upon Mr. Smith in 1866 by the University of New York. It was the first degree of the kind ever conferred in this country.

David Thomas.

David Thomas, inventor of the process of smelting iron with anthracite coal, died at his home, in Catasauqua, Pa., June 20. Mr. Thomas was born in Wales, November 3, 1794. At the age of eighteen, he went to work in a blast furnace in which coke was used. Subsequently, when at work in a furnace built over a fire bed of anthracite coal, he began to experiment with it, finally arriving at the knowledge that the one thing needed to make anthracite available for iron making was a stronger and hotter blast than was employed with other coals. The first successful anthracite iron furnace was completed in February, 1837. The same year Mr. Thomas was engaged by the Lehigh Coal and Navigation Company to set up an anthracite furnace in Pennsylvania. It was completed in 1839, and became the founda tion of the vast iron industry at Catasauqua. Mr. Thomas lived to see 5,000,000 tons of pig iron produced annually by the process he invented.

The Iowa Tornado.

On Friday and Saturday, June 17–18, a severe storm swept over the Central West, and a number of violent whirlwinds were developed in a belt of country four hundred miles wide, along the southern edge of a barometric depression stretching from Dakota to Lake Michigan. The greatest havoc was wrought, Saturday night, in Iowa, beginning at Jefferson, ninety miles west of Grinnell, and trending eastward and southerly past Grinnell to Iron Ridge and Mount Pleasant, a distance of 200 miles. For a distance of 150 miles across a thickly settled portion of the State the tornado swept a path half a mile wide, wrecking in its course parts of Grinnell, Malcolm, Mount Pleasant, and smaller settlements, besides a vast number of detached farm houses. The *Des Moines Register* had learned (June 20) the names of sixty-nine killed and five hundred wounded, perhaps one hundred of them fatally. Over three hundred families had their homes entirely wrecked. Iowa College had all its buildings destroyed.

One remarkable feature of the storm was the late hour of the occurrence of the severe whirls. The fierceness of the tornado near Grinnell was first felt about seven miles north west, where at eight o'clock in the evening, buildings were blown down in the track of two waterspouts, causing five deaths. Immediately northwest of Grinnell the two water funnels merged into one, and struck the west line of the town where the most lives were lost. The buildings were smaller, and many of them were without cellars. In the northern part of the city, where the houses were larger and with more cellars, there was less fatality. After wrecking the large college buildings—a three story brick and a four story stone structure—the storm seemed to narrow and take on more of the whirling character, twisting buildings in all conceivable directions. Professor Macomber, of the Agricultural College, gives the width of the storm funnel there as 300 feet. Trenches were torn by it in the ground from one to three feet deep and fifty feet long, probably plowed by wrecks of houses. It is estimated that fifteen hundred persons in Iowa were left homeless and impoverished by the storm. The general storm of the 17th was exceptionally severe throughout Kansas, Missouri, and Illinois. Many buildings and vessels were wrecked at St. Louis and across the river at East St. Louis. Much damage was also done at Kansas City, Mo., and elsewhere. The storm was severe also in Canada, and something like a tornado was felt as far east as Saratoga in this State.

The Recent Eclipse of the Sun.

The chiefs of the English, Italian, and French eclipse expeditions to Egypt, Messrs. Lockyer, Tacchini, and Thollon, report their observations in the following collective dispatch:

Unprecedented facilities were accorded by the Egyptian Government for the observation of the eclipse. A plan was agreed upon between the English, French, and Italian expeditions. Among the results the most satisfactory are photographs of the corona and a complete spectrum obtained by Schuster on Abney's plates. H and K are the most intense lines. A study of the red end of the spectrum of corona and protuberances was made by Tacchini. A comet near the sun was a striking object; it was photographed and observed by the naked eye. Bright lines were observed before and after totality at different heights by Lockyer, with intensities differing from Fraunhofer's lines; by Lockyer and Trepied an absolute determination was made of the coronal line 1474 in Kirchhoff's scale; by Thollon and Trepied the absence of dark lines from the coronal spectrum was noted. Tacchini and Thollon, with very different dispersions, noted many bright lines in the violet. Thollon observed spectrum of the corona, and Schuster photographed it. The hydrogen and coronal line were studied in the grating spectroscope by Buisieux, and with direct vision prism by Thollon. Rings were observed in the grating by Lockyer, of the first, second, and third order. The continuous spectrum is fainter than 1878, stronger than 1871. An intensification of the absorption lines was observed in group B, at moon's edge, by Trepied and Thollon.

American Watches in New Zealand.

In a report on the watch and clock trade of New Zealand, Consul Griffin says that, though the introduction of American clocks and watches into New Zealand is comparatively of recent date, they have become so very popular and so general in use that the trade in them bids fair to swell to large proportions. Most of these goods reach New Zealand by way of London.

Mr. Bartlett, a leading jeweler of Queen Street, Auckland, said to Mr. Griffin:

"It is difficult to sell an English watch, and as far as the Geneva watches are concerned, they are being fast driven from the market. Everybody seems to want an American watch. I am not prepared to say that American watches are any better than other watches, but it is the fashion to have them. There is not a boy or a servant girl in the country who can raise five pounds, who does not want to invest it in an American watch."

Mr. Bartlett, while acknowledging the popularity of American watches, expresses a decided preference for the old-fashioned hand-made watch, but frankly admits that his customers do not agree with him.

Artificial Parchment.

Messrs. Herold & Gawalowski, of Bruun, make as follows, a strong, artificial parchment, impermeable by water, and capable of serving for the diaphragm in osmotic operations on solutions of impure sugar, etc.: The woolen or cotton tissues are freed, by washing, from the foreign substances, such as gum, starch, etc., which may cover them. They are then placed in a bath slightly charged with paper pulp; and to make this pulp penetrate more deeply, they are passed between two rollers, which slightly compress them. The principal operation consists in steeping the product for a few seconds in a bath of concentrated sulphuric acid, after which it undergoes a series of washings in water and ammoniacal liquor, until it has lost all trace of acid or base. It is then compressed between two steel rollers, dried between two others, covered with felt, and finally calendered, when they are fit for use.

NEW QUICK ADJUSTING VISE.

We give perspective and sectional views of an improved form of quick adjusting parallel bench vise with screw clamp, recently patented by Mr. John Thomson, No. 9 Spruce street, New York city. This tool is made by the Colts Patent Firearms Manufacturing Company, of Hartford, Conn. The general appearance of one style of this vise is shown in Fig. 1, while Fig. 3 shows a longitudinal section, and Fig. 2 an end view. The two jaws, *a b*, are similar to each other, and are connected and guided by two parallel round rods. The lower rod, *d*, is forced tightly into the front jaw, but is free to slide through an accurate bearing of ample length formed in the fixed or back jaw. The upper rod, *f*, is flattened on a portion of its lower side, and is provided with ratchet teeth, engaging in which is a pawl, *h*, housed within the back jaw and retained in the mesh by a spring, indicated in the engraving by *i*. To the pawl shaft two disengaging handles are secured, one on each side of the device, which are shown in the end view, Fig. 2. The forward end of the upper rod is fitted in the front jaw and forms the nut for the clamping screw, *e*. The screw is made one-eighth of an inch pitch, and square thread. The action of the screw is limited to 1¼ inches by a stop piece, *g*. This prevents subjecting the threads of the screw and nut to a strain when having but a slight bearing, and also prevents the rod from turning with the screw. The arrows stamped on the ratchet rod are for indicating the relative location of the screw in the nut.

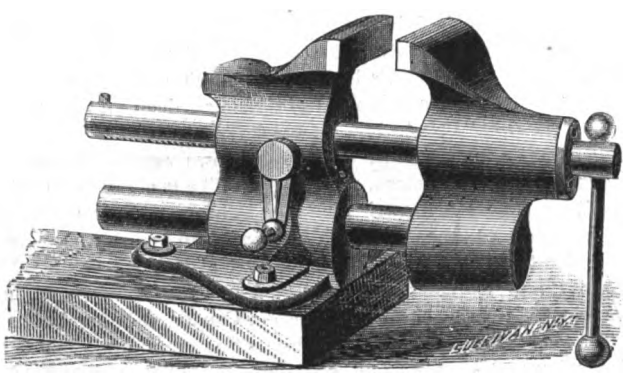


Fig. 1.—Thomson's Quick Adjusting Parallel Vise.

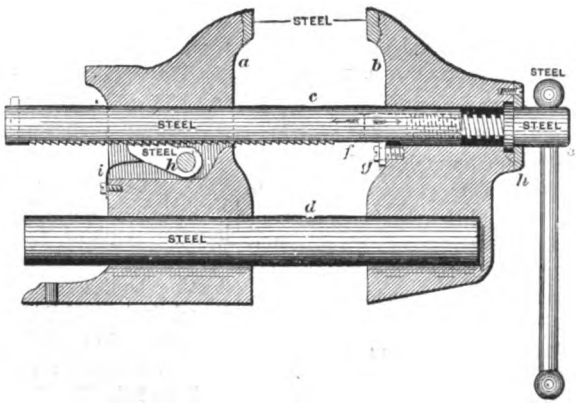


Fig. 3.—Longitudinal Section through the Vise.

In clamping and unclamping work of nearly uniform size, say within one inch, the device is used as an ordinary screw vise. To make a quick and extreme adjustment, one hand is placed on the clamping lever and the other hand on either of the disengaging handles. At practically the same instant both hands are drawn forward, which disengages the pawl from the ratchet and permits the withdrawal of the front jaw to the limit of the stop pin. When in this position the work is inserted against the face of the back jaw, and, with the hand on the clamping lever as before, the front jaw is forced up to meet the work, the ratchet teeth sliding idly past the teeth of the pawl. At this point the action of the hand is changed into a rotative movement with the clamping lever, which instantly secures the work. Some of the advantages claimed for this vise are as follows: All the advantages of a screw vise, with instant adjustment for varying sizes of work; the screw being used only to secure the final pressure permits the use of a fine pitch and short hand lever, and this insures a rapid and firm clamping of the work by the application of moderate pressure. Two disengaging handles being employed, the adjustment of the jaws may be effected with equal facility, from any position that the operator may occupy, with either hand. In material the jaws are of cast iron; the slide shaft, ratchet-shaft, pawl, pawl-shaft, screw and clamping lever, and also the face of the jaws, which are welded to the iron, are of steel. This vise is manufactured as a machine tool, and all the parts are interchangeable. The bearings and working parts are finely finished.

NOVEL CARPET STRETCHER AND CARPET FASTENER.

We give engravings of some novel devices for stretching and fastening carpets, recently patented by Mr. William E. Henderson, of Iron Mountain, Mo. The stretchers are of two forms, one operated by a lever, the other by a windlass or crab. Figs. 1 and 2 show the crab stretcher, and Fig. 3 represents the lever employed in some cases instead of the crab. The stretcher plate in its under side and toward or at its rear edge has a series of teeth or points inclined or curved forward, as shown, and at or toward its forward edge it has two teeth or points near opposite ends. A cord attached to the stretcher plate leads from the under side and is connected with a crab having teeth or points in the under side of the base plate. A cord leads from the crab shaft and connects with the cord attached to the stretcher.

In use the stretcher plate is connected with the carpet by means of its teeth. The crab is fixed in front of the plate by inserting its teeth in the floor and holding the end of the base plate down. Then by winding the cord on the crab shaft the stretcher plate is drawn forward, the carpet being lifted slightly from the floor and stretched in the desired direction. If the carpet needs a second stretching, the stretcher plate is fixed and the carpet prevented from slipping back by pressing the forward edge of the plate down, so as to fix the points in the floor. When this is done the crab is moved and readjusted and the stretching operation repeated.

When the lever shown in Fig. 3 is employed, the same stretcher plate and draught cord are used; but the lever replaces the crab. The lever is pointed at its lower end to engage in the floor, and is slotted to receive the draught cord of the stretcher plate.

In the carpet fastener shown in Figs. 4, 5, and 6, the carpet is held in place upon the floor by means of a strip or plate pressed downward on the carpet, binding it down to the floor sufficiently to hold the carpet from slipping, the strip or plate in turn being held down upon the carpet by means of screws, that are held by a strip, attached to the wall or base board of the room where the carpet is laid.

In Fig. 4 the complete fastener is shown. In Fig. 5 the method of fastening the holding strip to the base board is represented, and Fig. 6 shows the screw pressing downward on the top of the strip, which bears upon the carpet and holds it securely. This fastening is much neater than the usual method of fastening by tacks or ordinary fasteners, as it does not permit of the accumulation of dirt between the edge of the carpet and base board. It excludes bugs and moths, and furnishes in connection with the stretcher a complete method of putting down carpets.

The stretcher may be made of any desired width to adapt it to the size of the carpet, and the design of the fastening may be made to correspond with the other woodwork of the building in which it is used.

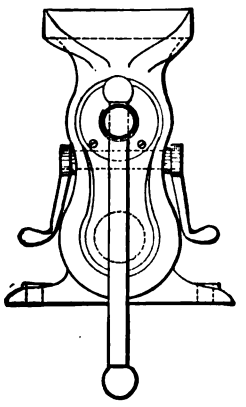
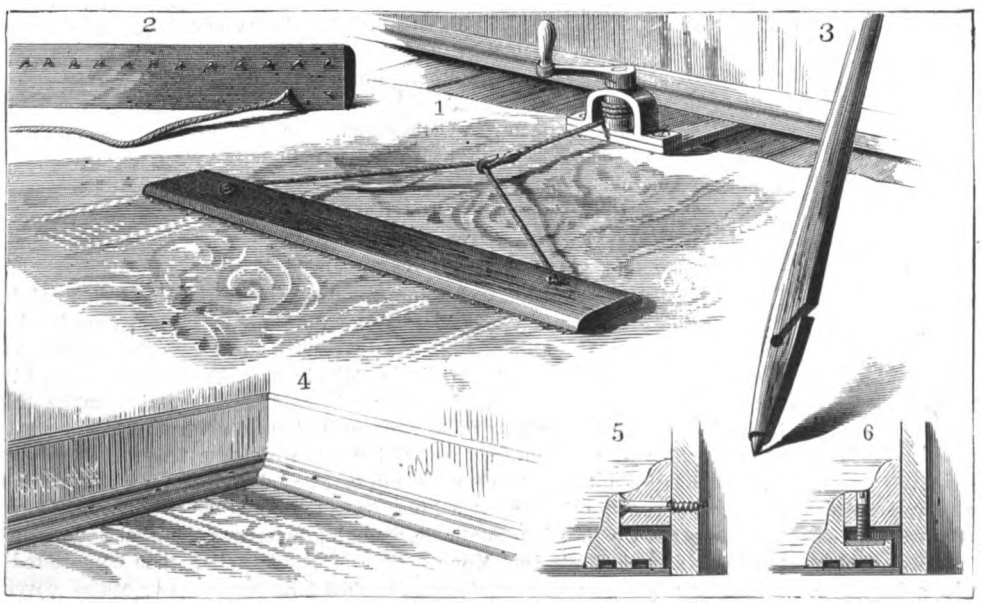


Fig. 2.—End View of the Vise, showing the Disengaging Handles.



HENDERSON'S CARPET STRETCHER AND CARPET FASTENER.

Castor Oil Plants as Fly Killers.

Observations made by M. Rafford, a member of the Société d'Horticulture at Limoges, show that a castor oil plant having been placed in a room infested with flies, they disappeared as by enchantment. Wishing to find the cause, he soon found under the castor oil plant a number of dead flies, and a large number of bodies had remained clinging to the under surface of the leaves. It would, therefore, appear that the leaves of the castor oil plant give out an essential oil or some toxic principle which possesses very strong insecticide qualities. Castor oil plants are in France very much used as ornamental plants in rooms, and they resist very well variations of atmosphere and temperature. As the castor oil plant is much grown and cultivated in all gardens, the *Journal d'Agriculture* points out that it would be worth while to try decoctions of the leaves to destroy the green flies and other insects which in summer are so destructive to plants and fruit trees.

Discoveries and Inventions the only Stable Capital.

In the *Atlantic Monthly* for May, Mr. Edward Atkinson says: "There is one form of fixed capital, which has been steadily increasing for all time, but which has accumulated more rapidly during the last century than ever before. It is the only kind of capital that has any stability, and the only kind that is of any permanent use in the world. It becomes in a very short time the common property of all, and is therefore one of the most substantial examples of communism which can be cited.

This capital consists in the inventions and discoveries in applied science — the immaterial capital of the world. The representatives of this work, without whom those who are known as great capitalists would be powerless, are the theorists in science; the men, who, having combined the results of observation, first indulge in bold hypotheses, then venture upon experiments, and lastly construct true theories, in accordance with which practical men work out the applications of science to art and industry. These men are the great instruments for promoting the common good of humanity; and they, together with those who level the ways and remove the material obstructions to commerce by carrying the rails over mountain sides, through tunnels and across the great plains, or who send ships across the sea, 'weaving the web of concord among nations,' are the chosen prophets, the elect among men, who are surely bringing about the solidarity of nations, rendering subsistence easy and certain, and bringing to the people of all lands the common enjoyment of the gifts of the Creator."

Quinine Trees.

During the last two or three years a bark containing quinine and quinidine has been imported into England from Columbia in such enormous quantities as to equal or even sometimes exceed the whole of the importations of cinchona bark from all other countries. The botanical source of this bark, which is known in commerce under the name of Cuprea Cinchona, on account of its peculiar coppery tint, has hitherto been a mystery. M. Triana, the well known quinologist, has recently succeeded in tracing it out, and has stated, in the *Pharmaceutical Journal* for April 22, that it is derived in great measure from two species of the nearly allied genus *Remijia*, none of the members of which were previously known to contain quinine. Several species of *Remijia* have leaves resembling those of the true cinchonas, and of these M. Triana has determined that *R. purdieana*, Wedd., and *R. pedunculata*, Karsten, certainly yield cuprea bark, the former being the species which contains the alkaloid cinchonamine, recently discovered by M. Arnaud. It appears probable that other species also yield the cuprea cinchona of commerce, but definite information on this point is still wanting. The value of this bark has led, according to M. Triana, to great devastation of the forests in which the trees grow, and has produced a financial stagnation, business being neglected in order to follow the more profitable occupation of collecting the bark. Fortunately seeds of the tree have been received and are now in cultivation at Malvern House, Sydenham. The tree is likely to prove valuable for cultivation in countries where malarial fever abounds, since it grows at an elevation of 200–1000 meters above the sea, at which even red cinchona bark will not flourish.

UNUSUAL hail storms are reported from various parts of the South, the hail stones being of exceptionally large size. In one or two instances men have been killed by the pelting blocks of ice "as large as a man's fist." Still worse storms have been reported in Europe. The Sicilian *Gazette* tells of one which wrecked a village. When it was over it was found that eleven persons had lost their lives, their bodies being found disfigured beyond recognition; horses and cattle were killed, and many buildings so badly injured that they had to be torn down.

The Lay Torpedo.

The most successful type of the movable torpedo is found in the invention of Mr. John L. Lay, of Buffalo, New York, who has heretofore been mentioned as associated with Chief Engineer Wood in the invention of the torpedo used by Cushing. As excellent as the Lay undoubtedly is, it still has the same defect as others, namely, want of sufficient speed; this, however, does not seem to be an insuperable obstacle, and with each successive construction a greater speed is obtained. The boat is always under the control of the operator, who can stop or start it, steer to either one side or the other, or fire the charge whenever he pleases. All these things are, of course, extremely advantageous, and greatly enhance the value of the weapon. The motive power is carbonic acid gas. This gas (as is well known) becomes liquefied under a pressure of forty atmospheres, and in this state it is stored in a flask in the boat. When the valve closing this flask is open, vaporization ensues, and the gas is taken to the engine, first passing an automatically acting reducing valve, so that the pressure will not be too great. As the liquid expands, great cold is produced, and trouble is experienced from its use as a motor; this, however, is not a serious difficulty, and remedy will doubtless be found. The explosive chamber, containing 500 pounds of material, is at the bow, and is so constructed that on contact with a vessel it is disengaged from its resting place, and drops several feet, the idea being that an explosion in that position will do more damage than at the water line. In one compartment of the boat is a drum, from which is paid out the cable through which the electric current passes. A suitable arrangement of magnets opens a valve which allows gas to enter a cylinder, the piston in which causes the helm to be put in the desired direction; and a similar arrangement causes the throttle of the engine to open or close. The explosion is caused on contact if it is desired, or it may always be kept under the operator's control. Some of these boats have but one wire in the cable, over which the various functions are caused to operate; others have a multiple cable, with a wire for each thing required to be done. Over a mile and a half of wire is carried, so that the effective range becomes very much greater than that of any of its rivals. Mr. Lay is constantly at work introducing improvements, all of which are protected by numerous patents. His system has been definitely adopted by Russia after a satisfactory trial of ten of the boats built for her. A factory has been established, and it is proposed to use them very extensively in any future war. —*Harper's Magazine.*

NEW BALING PRESS.

We give an engraving of a new press for baling hay, cotton, straw, tow, wool, and similar substances. It is compact, powerful, and quick acting, employing the toggle joint driven by suitable gearing to create the pressure; the mechanical arrangement being such as to insure the greatest pressure at a time when there is most resistance, that is, as the compression of the bale nears completion. The press is horizontal, and the toggle moves the followers that compress the bales in opposite directions at the same time, two bales being pressed and delivered simultaneously. The press boxes are on opposite ends of the press, and the plungers move on trucks or rolls in each of the boxes. These plungers are connected by heavy links with the toggle joint, which, together with the links, is supported by suspenders or swinging arms pivoted at the top of the press frame.

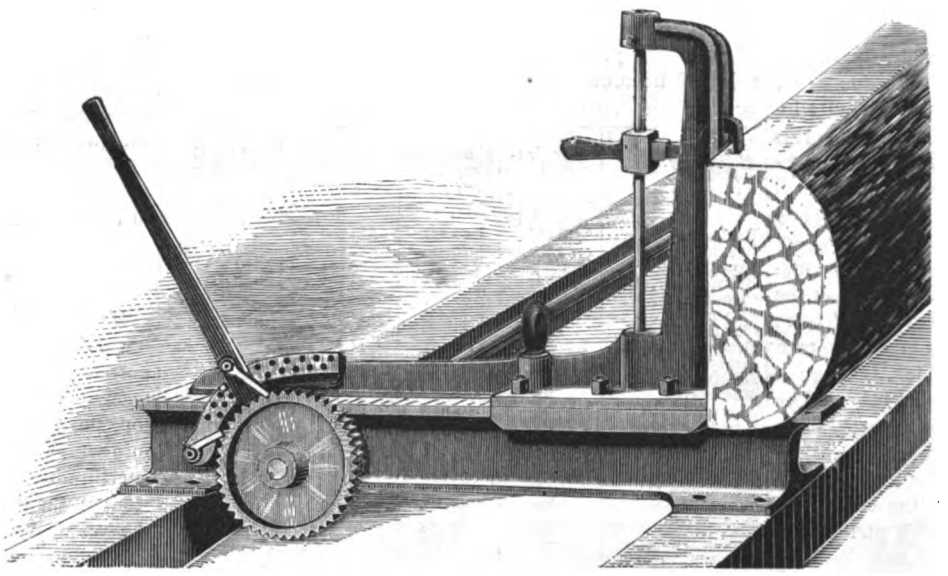
The toggle takes its motion from the crank driven by the gearing at the top of the frame, the gearing taking its power through a belt or otherwise as may be most convenient. The middle joint of the toggle is provided with rollers which are guided by the two uprights at the middle of the frame.

At each end of the machine and above the press boxes there is a pair of belts arranged triangularly around three or more sets of pulleys secured to the frame; the belts carry three or more gates which pass through the upper part of the press boxes. These gates move successively into position in the press boxes as they are needed by the forward movement of the material being pressed. They take their places at the right time, this result being secured by spacing the gates at the required intervals on their belts.

Each press box is provided with a feeding trough or chutes projecting from it at right angles, and having working plungers that feed the hay or straw into the press boxes in front of the plungers. The proper movement of these feeding plungers is secured by cams connected with the reciprocating plungers of the press. The press boxes are arranged to contract the bale laterally as it is moved forward, and there are spring catches to hold the gates in their places in the boxes when the hay is pressed. When the press is in operation a platform is to be built between the feed boxes and on a level with their tops.

It is claimed for this press that it will press two bales while an ordinary press completes only one, without anything like a corresponding amount of labor. The pressure is applied gradually, and therefore does not break up or thrash the hay. The material to be pressed is introduced low at the side of the machine, thus saving a great amount of handling. The gates being carried by the belts saves the labor of placing them by hand, and insures a greater uniformity in the size of the bales, as they are of necessity uniformly spaced.

Further information may be obtained by addressing the manufacturers, Messrs. Elliott & Torrance, Brookfield, Missouri.



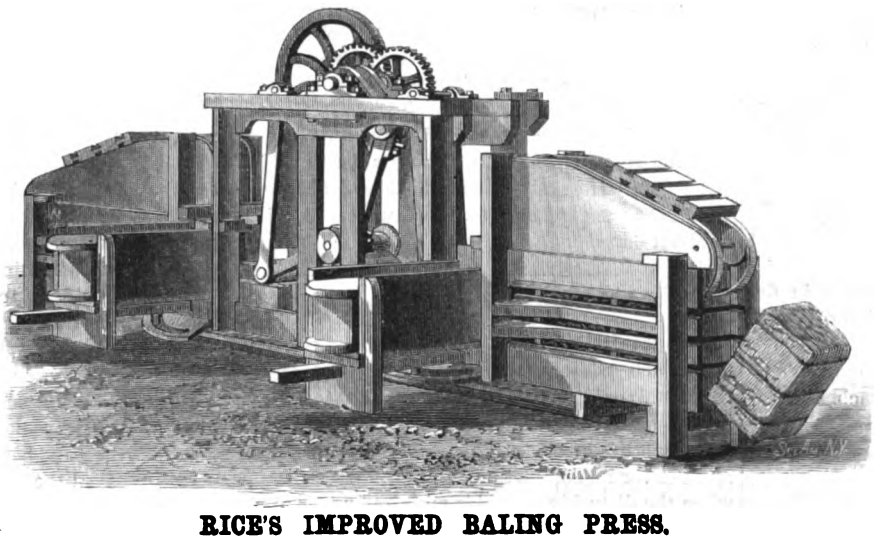
CARLEY'S MILL DOG.

NEW MILL DOG.

The engraving shows a new saw mill dog manufactured by Messrs. Alexander, Bradley & Dunning, of Syracuse, N. Y. This dog is entirely automatic, requiring no driving or forcing to make it enter the log, it being only necessary to raise it, and let it fall, to insure its firm fastening in the edge of the board or cant. It holds entirely from the top, drawing the cant or board toward the stake, instead of pushing it from the stake. It works equally well in hard and frozen timber and soft wood.

The dog is made of steel, and is placed on a steel rod attached to the stake, and, projecting through a slot in the center of the stake. This arrangement of the slotted stake and dog prevents the board or cant from sliding endwise.

This dog is always in place ready to be used when required, and it holds with all the firmness of the more complicated and expensive machinery. It is readily disengaged by raising the handle; and when it is not in use it falls back out of the way, and cannot by any chance come into contact with the saw.



RICE'S IMPROVED BALING PRESS.

Messrs. Alexander, Bradley & Dunning put this improvement on all their saw mills without extra charge.

Influence of Early Feeding upon Vitality.

Investigations made in Germany concerning the comparative vitality of children under various methods of feeding exhibit some peculiar results. Thus, of 100 children nursed by their mothers only 18·2 died during the first year; of those nursed by wet nurses, 29·33 died; of those artificially fed, 60 died; and of those brought up in institutions, 80 died to the 100. Again, taking 1,000 well-to-do persons and 1,000 poor persons, there remained of the prosperous, after five years, 943, while of the poor only 655 remained alive; after fifty years there remained of the prosperous 557, and only 283 of the poor; at seventy years of age there remained of the prosperous 235, and but 65 of the poor. The total average length of life among the well-off class was found to be fifty years, as against thirty-two among the poor.

The Great Vienna Telescope.

The largest equatorial refracting telescope at present in existence is now *en route* from Dublin to its final destination—the great Vienna observatory. This telescope, says the *British Journal of Photography*, the *magnus opus* of our esteemed contributor, Mr. Howard Grubb, adds another laurel to the scientific workers of Ireland, who, hitherto unrivaled in reflectors, are now equally foremost in refractors. The mechanical parts of this telescope were completed so long ago as the year 1878; but, owing to the difficulty in obtaining perfect disks of glass, great delay occurred in finishing it, and it was not till about twelve months ago that the commission appointed by the Austro-Hungarian government to report upon it transmitted to headquarters their report, which stated their full approval of the manner in which the work was carried out. The value of this report will be seen when our readers know that the commission was composed of such distinguished men as Professor Ball, the Earl of Crawfurd and Balcarres, Mr. Huggins, Professor J. Emerson Reynolds, the Earl of Rosse, Professor Stokes, Dr. G. Stoney, and Mr. Walsh, the Austro-Hungarian consul at Dublin. The object glass is twenty-seven inches in diameter, and the telescope tube thirty-three and a half feet in length—just over a yard in diameter in the middle—tapered to the width of the object glass at one end and to twelve inches at the other. It is composed of steel plate about an eighth of an inch thick in the center and a twelfth at the ends. The weight of the whole of the moving parts is between six and seven tons; and yet, so marvelously and cleverly arranged are all the adjustments, that the whole can be moved and set to position by one man's unaided arm. The immensity of the instrument constitutes it a marvelous production, but even this is secondary to the nicety of precision, the ease of the movements, and the excellence of the great lens. Additional luster is conferred on the eminent constructor by the fact that he was specially chosen to construct the telescope upon the recommendation of the General Director of the works, who had made a tour of inspection, and examined all the great observatories and astronomical workshops of Europe and America before making his recommendation. [The object glass of the above telescope is one inch larger than that of the great instrument at Washington.]

A Large Establishment.

One of the largest manufacturing establishments in Europe is the Cockerill Iron and Steel Works, at Seraing, near Liege, in Belgium. The works, on the right bank of the Meuse, cover an area of 267 acres.

The number of workmen and employes is 8,770, having been 9,100 in 1875. The capital of the company is $3,000,000. The amount paid yearly in wages and salaries varies between $1,600,000 and $2,000,000. The total horse power of the 280 engines is 11,660; and the daily consumption of coal exceeds 1,000 tons. When the works are in full swing, the products reach a value of $8,000,000. The twelve divisions under which the various departments are classified are capable of turning out yearly 100 locomotives, 70 steam engines, 1,500 pieces of mechanism, 10,000 tons of roofs, bridges, turntables, and boilers, and 14 steam vessels in iron or steel, besides hydraulic presses, cranes, and travelers. The yearly production of coal from collieries owned and worked by the company is 400,000 tons, and of coke 110,000. The mines owned by the company, situated in Belgium, produce 150,000 tons of iron ore; and those in foreign countries 170,000 tons. The blast furnaces turn out 10,000 tons of common, and 700,000 tons of Bessemer pig a year. Castings to the amount of 6,000 tons; bars, plates, and joists to the tune of 26,000 tons; steel rails, tires, cannons, etc., weighing 70,000 tons; 28,000 tons of engines and machinery, and 80,000 tons of vessels, leave the works annually.

Diving for Black Pearls.

Diving for black pearls employs a large number of men and boats off the coast of Lower California. Traders supply the vessels and diving apparatus upon the stipulation that the pearls that are found are to be sold to them at specified rates. These jewels are of much beauty and highly prized. A year's production is worth on an average from $500,000 to $1,000,000.

NARCISSE LECOMTE, one of the most eminent French engravers of the first half of the present century, has just died in Paris, at the advanced age of 88. Lecomte, who was a pupil of the Ecole des Beaux-Arts, and several times decorated, is perhaps best known by his engraving of Dante and Beatrice, after Ary Scheffer.

THE GREAT BELL FOR ST. PAUL'S.

[*Continued from first page.*]

On Saturday afternoon, having arrived near Highgate, on the road from Finchley, the bell was met by thousands of Londoners, who came up the Archway Road to witness such an unusual spectacle. It was taken into the coalyard of the Great Northern Railway at the Woodman Station, and was left there till Monday morning, when it was brought at an early hour into London, reaching St. Paul's Churchyard at eight o'clock. The arrangements made by Mr. Penrose, architect and surveyor to the Dean and Chapter of St. Paul's, for removing the bell from its traveling-carriage and introducing it within the south tower of the west front of the Cathedral, were not the least remarkable part of the undertaking. Some difficulty had been presented by the fact that the doorway into the tower proved too narrow by about 2½ feet, and the solid stone walls had to be cut away on each side, near the ground, while the masonry above had to be shored up with great care and ingenuity. Between this door and the spot at which the bell-carriage was drawn up, an elaborate timber slope had been constructed of beams 12 in. or 14 in. square, surfaced with slabs of oak, rendered slippery by a smearing of tallow and black lead. On to this slope the bell was dragged by the force of ropes and crabs or windlasses, but resting upon a circular wooden disk, to which it was fastened. The bell was thus enabled to slide slowly down in front of the door, and was then dragged up another short incline into the center of the tower. The machinery for lifting the bell to a height of 125 feet in the tower was very simple, consisting of two "crabs" from Woolwich Dockyard, each worked by four men, two men at each handle, to haul the ropes, 2¼ in. thick, through a series of blocks and pulleys, two above and two below. The operation would be done very slowly, but was expected to be performed on Wednesday or Thursday. There is a clear passage for the bell up the center of the winding staircase in the tower. Its destined position is beside the clock, and below the present big bell of St. Paul's, which strikes the hours.—*Illustrated London News.*

A Practical Sulphite-pyro Developer for Gelatine Plates.

BY W. T. WILKINSON.

Prepare two stock solutions as follows:

SOLUTION NO. 1.

Sulphite of soda (pure recrystallized)	4 oz.
Water	40 oz.

Dissolve the sulphite of soda, then add enough of a solution of citric acid to make a slight acid reaction with litmus paper. Then add one ounce of pryogallic acid. Increase the bulk of solution by the addition of water till it equals 54 ounces. Each ounce of solution will then contain 8 grains of pyrogallic acid.

SOLUTION NO. 2.

Water	40 oz.
Ammonia, strength 880°	1 oz.
Bromide ammonia	180 grs.

To commence development mix one part of No. 2 with two parts of No. 1, and immerse the plate in the developer thus made.

If the image does not appear within a minute and a half, add a small quantity of No. 2, which will increase the rapidity of development, which should be continued until the outline of the picture appears on the back of the film.

Equal parts of No. 1 and No. 2 will give a four grain pyro solution a strength which is a very good average. Under exposure with this developer does not yield harsh dense negatives, and if during development the exposure is seen to be too short the negative is removed from the developer, washed, and immersed for three or four minutes in solution No. 2, after which about one-quarter of the usual quantity of No. 1 is added, and a far finer result will be obtained than by the old process.

Over-exposure does not produce extreme flatness; in developing an over-exposed plate a large proportion of No. 1 and a minimum of No. 2 should be used.

From two to three plates can be developed in one mixed developer by adding a few drops of No. 2 each time.—*British Journal of Photography.*

Some Facts about Quicksilver.

In an elaborate report on the quicksilver trade of the world, Consul-General Vogeler, of Frankfort-on-the-Main, says that of late years California has supplied more than half of the quicksilver consumed in the world. Only two countries of Europe produce quicksilver in sufficient quantities to deserve mention in a commercial report—Spain and Austria.

The Spanish mines are located near the town of Almaden, province of Mancha, and were formerly owned and operated by the Spanish Government. They are now, however, held and operated by the great firm of Rothschild Brothers, of London, England, as security for a loan made by them to the Spanish Government; indeed, they seem to be, to all intents and purposes, the property of that firm. These mines yield about four-fifths of the entire production of Europe, while the Austrian mines, located near Idria, and the minor mines mentioned, produce the other one-fifth. As a consequence London, to which place almost the entire product of the Almaden mines is shipped, is the controlling market of Europe, and Rothschild fixes the price of the metal, except in so far as California, which produces more quicksilver than Spain and Austria combined, may undertake to become a disturbing element in that direction.

Quicksilver is carried and shipped in wrought iron flasks of 25 pounds, containing 75 pounds of the metal. Prices throughout Europe are always given in English money, and the quotations invariably refer to the flasks described.

The consumption of quicksilver in the world was estimated in the year 1876 to amount to about 80,000 flasks per year; in 1877 it reached 100,000 flasks; and since then it has averaged 133,000 flasks a year.

The principal uses to which quicksilver is applied are: (1) Meteorological and other scientific instruments; (2) chemical preparations; (3) looking-glasses and mirrors.

Twenty Centers of Manufacturing Industry.

The Census Bureau has just published the statistics of the manufacturing industries of twenty of the leading cities of the United States. The following figures show the number of manufacturing establishments in these cities, the number of men employed, the amount of capital invested, and the value of the annual product in the shape of manufactured goods:

City.	Manufactories.	Number of Employes.	Capital.	Annual Product.
Baltimore	3,596	55,201	$35,760,108	$75,621,388
Boston	2,521	56,813	42,750,134	123,866,137
Brooklyn	5,089	45,226	56,621,899	169,757,590
Buffalo	1,137	16,838	24,188,562	40,008,205
Chicago	3,479	77,601	64,177,385	241,045,607
Cincinnati	3,231	52,184	48,278,732	94,869,105
Cleveland	1,068	21,499	18,134,789	47,352,208
Detroit	875	15,062	14,202,159	28,306,580
Jersey City	555	10,688	11,329,915	59,581,141
Louisville	1,066	16,569	19,583,013	33,381,733
Milwaukee	821	19,620	13,811,405	38,955,138
Newark	1,299	29,232	23,919,115	66,234,525
New Orleans	906	9,489	8,401,390	18,341,006
New York	11,162	217,977	164,917,856	448,209,248
Philadelphia	8,377	173,863	170,495,191	304,591,725
Pittsburg	1,071	36,465	50,976 903	74,241,889
Providence	1,186	21,336	23,573,332	39,596,653
San Francisco	2,860	26,062	29,417,218	71,613,385
St. Louis	2,886	39,724	45,385,785	104,383,587
Washington	961	7,116	5,381,226	11,641,185

It will be noticed that New York city leads, Philadelphia falling to the second place. Chicago is a good third, and is increasing her manufactures at a rate which promises to give her the second place before many years. Brooklyn takes the fourth place, and Boston the fifth.

New Galvanic Cell.

Mr. F. Higgins, of London, has recently exhibited a new arrangement of the well known bichromate of potash battery, which yields very powerful currents, and is exceedingly economical, inasmuch as it utilizes the waste liquor of other bichromate batteries, and the residual scraps of zinc left by the wasted zinc plates. The cell consists of an earthenware jar fitted with an overflow spout near the mouth, and on the bottom is placed the scrap zinc in a pool of mercury. A copper wire insulated with gutta percha except at the foot, where it enters the amalgam of zinc and mercury, passes down the middle of the jar. Two carbon plates arranged parallel to each other are suspended from the mouth of the cell by a frame, and connected together by an electrode. The battery of these cells is built up by placing each one a little below the one before it on a step, platform, or stair, so that the overflow liquor of one cell may run into the next, and thus a continual circulation of waste liquor may be going on from the high reservoir to the low one. This circulation prevents polarization of the plates and produces a powerful and steady current. The electromotive force of each cell is from 1·9 to 2 volts, and its internal resistance is a mere fraction of an ohm. Nine of these cells are now working nine Morse circuits in place of a battery of 250 Daniell cells. Mr. Higgins estimates that 7,000 to 8,000 foot pounds of current energy can be supplied by them at a cost of about 6d.

The Perfume of Metals.

Recent experiments of M. H. Pellat, communicated to the French Academy of Sciences, tend to show that when two metal surfaces are brought very close together (say within a few tenths of a millimeter) a slight change takes place in the properties of the surfaces. The change requires a few minutes for its completion, and gradually disappears again when the disturbing metal is withdrawn. The phenomenon is detected by measuring the differences of potential between the electric strata covering the surfaces of the two metals in contact. The strongest effect of the kind is produced by lead and iron placed near another metal. Copper, gold, and platinum give a distinct effect, but zinc does not appear to possess the power. It would seem from these experiments as if metals gave off at common temperatures a volatile substance which, when deposited on the surface of objects, modifies their chemical nature. This opinion of M. Pellat is supported in his view by what we know of the smell of metals, a subject investigated by the late Professor Rankine.

Luminous Photographs.

A film is made of perchloride of iron and tartaric acid on a surface of softened glass; when it has been exposed, sulphide of calcium, rubbed to a very fine powder through a sieve, is dusted over it. The image is formed in the same way as if it had been dusted with any other powder, and it can then be transferred to paper.

METALLURGICAL INVENTION.

Improvement in Amalgamators.

An improved amalgamator, in which the ore to be amalgamated is more thoroughly pulverized and mixed than is usual in dry amalgamating machines, is patented by Mr. Henry M. Jones, of Santa Fe, N. M. The amalgamator box is of rectangular form, and has at each of its ends inclined planes, for the purpose of keeping the quicksilver in the center of the box. A number of pointed spikes project through the box bottom two or three inches, and are firmly fixed to the bottom. Rollers are placed transversely in the box, and journaled in its sides, that support and carry an endless belt. They are so arranged that the portion of the belt that passes over the bottom portion of the box shall be parallel with it, and at the rear end of the box shall pass parallel to the inclined part. The belt is provided with teeth, set in diagonal rows, and so arranged that they move in the interstices between the teeth in the bottom of the box, and they are firmly secured to the belt by nuts and washers. The belt extends the full width of the box, and is moved by means of power applied to one of the rollers, and as it is revolved the ore (which is fed in at the top of the box) and the quicksilver are thoroughly mixed together by the action of the teeth on the belt and in the bottom of the box, and the lumps of ore are broken up to expose them to the action of the quicksilver.

MISCELLANEOUS INVENTION.

Mr. John Drew, of Old Mission, Mich., has patented a novel flower-tray, for keeping cut flowers fresh during transportation or exposition. The invention consists in a box open at the bottom and provided with an aperture in its top, and with a closed cup attached to the under side of its top, into which cup the stem of the flower is passed through the aperture in the top. The tray has devices for holding the stem of the flower in the cup attached to the under side of the top of the box. The box has a water-reservoir passed into the bottom of the box for the purpose of supplying the cup with water to keep the flowers alive and fresh.

Improved Process of Photo-Engraving.

The metal plate, whether of copper or of zinc, is, in the first place, coated with a very thin layer of bitumen of Judæa, and when this coat has become perfectly dry, a film of bichromatized albumen is flowed over the plate. It is then exposed to the light, and afterward washed with water in order to dissolve all the albumen which has not been rendered insoluble by the luminous action; it is next treated with spirit of turpentine, which dissolves all those parts of the layer of bitumen that have become exposed. The plate can then be attacked directly by water acidulated with from four to six per cent of nitric acid. The great advantage of this method consists in the high sensitiveness of the bichromatized albumen, at the same time preserving the solid reserve produced by the bitumen of Judæa on a metallic surface. The albumen flows completely over the bitumen layer, and there is nothing in the process different from its original form, except it be the use of the spirit of turpentine in order to clear the metal in those parts which have been previously stripped of the albumen.

Salt Lake Gulls as Insect Killers.

The Salt Lake (Utah) *Herald* says that sea gulls have been uncommonly numerous and active there this spring. Wherever there was a newly plowed field there you could see the gull, and as fast as a furrow was turned up the birds would fly behind the plowman and commence devouring the insects which were thus exposed to sight. They seemed perfectly fearless. And they have good reason to be fearless here, for the farmer looks upon them as his friend, and they seem to understand fully that he holds them in that light. They fly all about him, within three or four feet, and while perhaps unwilling to submit to being caught, they will allow any other familiarity that can be practiced, for they themselves take a great many good-natured liberties. They will not touch grain, or anything that the farmer desires should remain untouched; they only eat the worms and insects which are injurious to the soil and to crops. Only once before have the gulls been so numerous, and that was in 1848, when they saved the settlers from an invasion of mountain crickets.

The Regulation of Dreaming.

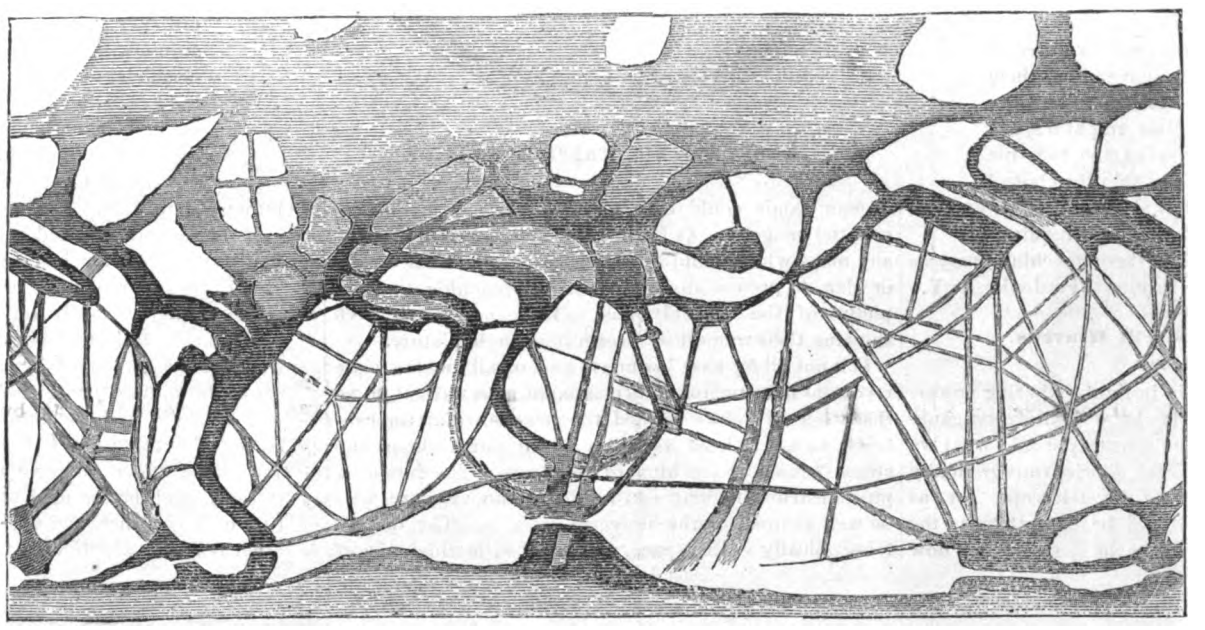
A French investigator, M. Delaunay, finds from experiments upon himself that the character of his dreaming may be controlled by stimulating various portions of the brain by means of heat. By covering his forehead with a layer of wadding he gets sane, intelligent dreams. He has also experimented on modes of lying, which favor the flow of blood to particular parts, increasing their nutrition and functional activity. He has observed that the dreams he has while lying on his back are sensorial, variegated, luxurious. Those experienced when on the right side are mobile, full of exaggeration, absurd, and refer to old matters; but those produced when on the left side are intelligent and reasonable, and relate to recent matters; in these dreams one often speaks.

These observations may be correct so far as Mr. Delaunay is concerned; but most people who venture to lie on their back, especially after eating, are apt to find their dreams anything but luxurious.

RECENT DISCOVERIES IN THE PLANET MARS.

Pending the preparation of a fuller and more detailed memoir, Prof. Schiaparelli, of Milan, has published a preliminary notice, read before the Academia dei Lincei on March 5, and accompanied by a photographed drawing of the planet's surface. The results are of a very remarkable and unexpected character; and as through the courtesy of this distinguished observer, the notice and photograph have been placed in my hands, I am induced to reproduce the latter, which, though not pretending to minute accuracy (the original, in fact, is only a provisional sketch), will give a sufficient idea of the marvelous duplication of the so-called "canals," which, between January 19 and February 24, in about twenty instances, unfolded itself progressively under the observer's eye.

The discussion which took place at the late meeting of the Astronomical Society, so far as my information extends, substantiated strongly by independent evidence the existence of these long, narrow streaks, some of them even in positions where they have not been delineated by Schiaparelli; but their duplication by similar and parallel lines does not seem to have been elsewhere noticed. Some difference of opinion may possibly be expected concerning these strange appearances; and the consequent enfeebling (to say the least of it) of the long admitted terrestrial analogy may be, to some minds, unacceptable; but the established reputation of the observer demands, at any rate, a respectful attention to his statements. It may be preferable to suspend a more detailed account till we receive a full elucidation of the subject in the memoir, of which we possess only a preliminary notice; for the present it may suffice to mention that he found the atmosphere of Mars apparently clearer than in 1877, and was thus enabled to recover the markings then detected more satisfactorily even than in 1879–80, and to confirm the general accuracy of his two earlier charts; while the concise but very clear intimations that he has given, as to the variable brightness of some great regions, the progressive enlargement on one side since 1879 of the "Kaiser Sea" (his Syrtis Magna), the brightening of certain supposed continents or islands toward the limbs, the confirmed existence of oblique white streaks, the unfolding of minute labyrinthine detail, and the continuous development already mentioned, day after day, of the collateral lines which double the so-called "canals," and extend with them ordinarily along great circles of the sphere—all these and similar announcements make us anxiously desire a more extended and detailed communication. For some of these most remarkable appearances parallels may be to a certain extent produced from the results of earlier observers; but, so far as at present appears, the duplication stands alone. The discoverer is disposed to infer a connection between these progressive developments and the seasons of the planet, and on that account hopes that, owing to the position of the axis at the ensuing opposition at the opening of 1884, notwithstanding the diminished diameter, only 12·9 seconds), confirmation of his announcements may be obtained from other observers. We sincerely trust that a report which has reached us may be verified as to the erection of a much larger telescope in the Royal Observatory at Milan, and that the extraordinary talent and diligence of the director may be richly rewarded, not only by the confirmation but the extension of results which must so materially influence our conclusions as to the physical condition of this peculiarly interesting planet.—*J. W. Webb, in Nature.*



RECENT DISCOVERIES IN THE PLANET MARS.

The Pintsch Light on the Erie Road.

A special exhibition of the Pintsch gas lighting system, as applied to railway trains, was made to a large number of railway and postal officials and others on the evening of June 12. A train of two coaches and a postal car was taken from Jersey City to Turner's and return to exhibit the light. The lamps were supplied with gas compressed in reservoirs under each car, the tubular receiver having a capacity of 344 feet of gas, under compression of 8½ atmospheres, or 127 pounds to the square inch. From this, tubes a quarter of an inch in diameter run to the various burners. A regulator consisting of an ingeniously weighted valve, prevents the gas from flowing too rapidly, and secures an even escapement, despite the varying pressure. The burners are of the fish tail pattern, composed of steatite, and of about one foot capacity per hour. Of these, in the mail car, there were 13 each of 17 candle power (Bunsen's photometer), and in the other cars four groups of five burners each, of about the same power. The gas is manufactured by the decomposition of shale oil refuse and fats generally, and consists mainly of olefiant gas and other heavy hydrocarbons. This is stored under a pressure of ten atmospheres in reservoirs near the track, whence through stout rubber tubes, the car receivers may be charged in from one to three minutes.

On the return to Jersey City, after four hours burning, the pressure in the reservoirs was found to have been reduced only two-thirds of an atmosphere. It was said that the mail car had been run to St. Louis and back with one supply of gas.

A Wild Goose Guard.

The San Francisco *Call* says that Dr. H. J. Glenn, whose wheat farm of 75,000 acres covers most of the arable land of Colusa county, California, is obliged to keep a company of forty riflemen to guard his grain from the depredations of wild geese. The men, mounted and armed with Henry rifles, patrol the farm during the day and on all moonlight nights.

They discover with their glasses the flocks of geese, which at a distance of 300 or 400 yards look like a white blanket spread over the green wheat, and they thereupon plant a bullet right in the middle of the flock. This unexpected visitation sets the flock on the wing, and the geese herder follows them up, keeps planting bullets among them till they rise to a great height, and, disgusted, leave the vicinity. Few geese are killed, the object being to keep them on the wing, and consequently off the wheat fields. Those that are killed are carried off and shorn of their feathers, but the revenue from them amounts to little. On Dr. Glenn's ranch about 8,000 cartridges are used in a day, which represents about 20,000 geese daily put to flight. Oftentimes a thick fog blows in, and this appears to be the favorite time for the geese, and they devour the wheat with great energy. The herders then, fearful of shooting one another, are almost baffled, but when the fog rises the flocks are put to flight, and for hours thereafter the air is filled with feathers and geese, and Glenn's ranch resounds with the clatter of rifles and the frightened cries of the persecuted fowl. To pay his men, buy ammunition, and maintain horses, costs Dr. Glenn some $10,000 per annum, but it saves his wheat, which yields $100,000, as without the geese herders half would be destroyed. The herders become very expert in their business, and are generally good shots and capital horsemen.

Unhealthy Milk.

Dr. E. F. Brush, of Mount Vernon, N. Y., calls attention to the fact that the sale of diseased and poisonous milk is a matter of more serious moment than that of watered or skimmed milk. He suggests as an outline of an improved system of milk laws: First, that all city milk dealers be compelled to procure a license from the Board of Health; secondly, that all milk dealers report to the Board the quantity of milk they sell and where it is obtained; thirdly, that in the death certificates of all children under two years of age, dying from certain specified forms of disease, the name of the milkman who had supplied them be inserted. By some such plan the board would be readily enabled to detect poisonous milk. If a certain form of infantile trouble was found to exist among the customers of a certain milkman, an inspector could be sent to the source from which the milk came to ascertain if there had been an epidemic in the dairy, if any of the cattle were suffering from disease, and if the milk from a cow too soon after calving had been sent to the city. A few years of observation like this, carried on conscientiously, he thinks, would enable the Board to propose intelligent laws regulating the sale of milk. Of one fact he is thoroughly convinced—that the sale of poisonous milk in New York city produces more trouble than if the whole supply was pure, healthy, skimmed milk.

RELIEF FOR THE ARCTIC COLONIES.—The schooner Leo, with supplies for the meteorological station at Point Barrow, Northern Alaska, will leave San Francisco, about June 20, hoping to reach the Point by the middle of August. Lieutenant Greeley's party at Lady Franklin Bay, Greenland, will be relieved by the steamer Neptune, which will leave Sydney, N. B., about July 1.

The Desert Sea.

The report on this subject, presented by M. de Freycinet, French Minister of Foreign Affairs to the President, has been published. He reports so far favorably that he considers the project worth the appointment of a special commission, for which purpose he has prepared a bill. The scheme under consideration is that of M. Roudaire, by which a canal nearly 150 miles long, 32½ feet below the sea level, and 328 feet wide, is to lead the waters of the Mediterranean from the Gulf of Gabes into the empty lake beds known as the *chotts* of Rharsa and Mebrir. Although the expense is variously calculated, M. de Freycinet does not consider that it will be prohibitory, if the formation of the lake is desirable on other grounds. In its favor it is urged that the climate of the regions lying round its shores will be improved, and their soil fertilized, that it will form an impassable barrier against the incursions of the nomad tribes from the Sahara and Tripoli, that it will greatly increase the commerce of Algeria and Tunis by furnishing them with internal water communication, and form a perfectly safe harbor of refuge for the French mercantile marine in time of war. The objections raised are that the great evaporation will leave the lake so salt that fish will be unable to live in it, and that the water will stagnate and become a source of pestilential miasma. M. Roudaire, however, is of opinion that a return currrent to the Mediterranean will be established in the bottom of the canal.

Welding by Pressure.

At a recent meeting of the Physical Society, London, Professor W. Chandler Roberts communicated the results he had obtained in repeating the experiments of M. W. Spring, Professor at the University of Liége, on the union of finely divided particles of metal by pressure. M. Spring had shown that at a pressure varying from 5,000 to 7,500 atmospheres, metallic filings may be united into coherent disks. Thus at a pressure of 6,000 atmospheres bismuth filings may be united into a disk, which has a crystalline fracture and a density which is identical with that of the metal cooled from the molten state. Zinc, again, also a very crystalline metal, will weld into a disk at a pressure of 7,000 atmospheres, 105,000 pounds to the square inch, and the metal will even "flow" into cracks between the die and the collar surrounding it, just as in the experiments of M. Tresca, lead "flowed" under similar circumstances. Professor Roberts had repeated and confirmed many of the experiments of M. Spring, whose more recent results are of special interest, as he has shown that if filings of bismuth, lead, and cadmium be *mixed* in suitable proportions—such, for instance, as in Wood's alloy—and if the mixture be submitted to a pressure of 7,500 atmospheres, 112,500 pounds to the square inch, an *alloy* is obtained which will actually fuse at 70° C., the true fusing point of Wood's alloy being 63° C. Professor Roberts showed to the Society an alloy he had prepared which melted below 100° C., although of the constituent metals the lowest melting point is 230° C., and he pointed out the great interest, both to the physicist and metallurgist, of M. Spring's results.

Defective Brick Piers.

The committee of architects appointed by Kraft, Holmes & Co., to investigate the fall of the building lately occupied by them, in St. Louis, have made their report. It is made on calculations based on standard authorities. No defects were found except in the basement piers.

The brick piers in the basement will have to carry the load of all the floors and roof added. This will be 74,100x5, equal to 370,500, to which add 7,410 and will have 377,910 pounds, which is 189 tons.

The dimension of the brick piers being one foot ten inches by two feet five inches, will give four and one-half square feet as the area of each pier. The average crushing load of first class hard brick work laid in cement mortar is about sixty tons per square foot, and again taking one-sixth as a factor of safety, we will have ten tons per square foot, as the safe load, and if each pier has four and one-half square feet, it will give forty-five tons as the safe load to be imposed upon piers of this size.

It will be seen from this that the load of 189 tons was four and one-quarter times as great as the pier was reasonably able to carry. It is therefore evident that the brick piers, being the weakest part of the structure, had to give way first, and they caused the disaster.

While the above calculations are based upon brick piers of the very best quality of workmanship and materials, the piers in this building were not a fair average of work.

NEW NUT TAPPING MACHINE.

We give herewith perspective and plan views, also a sectional elevation, of a new and very efficient nut tapping machine made by Messrs. Howard Brothers, Fredonia, N. Y. This machine has seven spindles, and its capacity is 8,000 nuts per day of ten hours.

The efficiency of this machine is sufficiently attested by the fact that a large number of the most important railway corporations, car manufacturers, locomotive works, machine shops, agricultural tool manufacturers, iron works, etc., etc., in the country are using them. Some of these firms are using as many as fifteen machines.

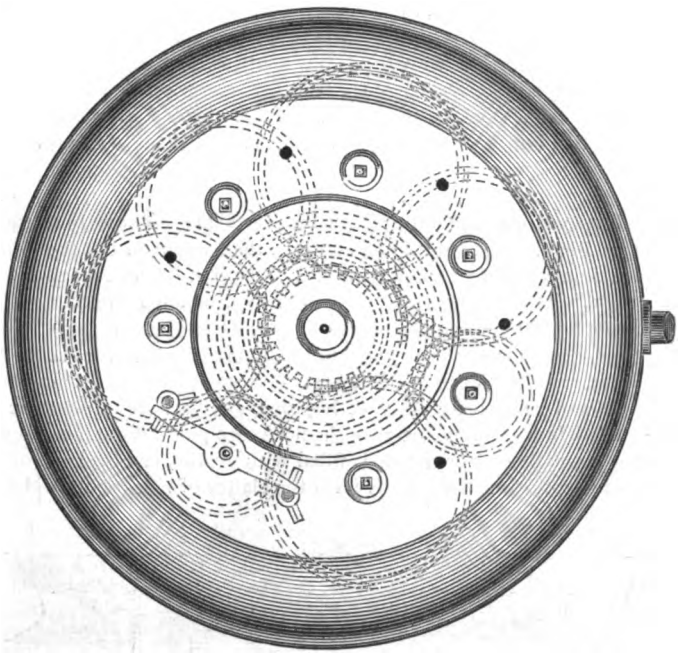
This machine runs seven taps with three different speeds, and is so arranged that two of the taps may be run with the fastest, two with the slowest, and three at the medium speed, at the same time—the gearing being arranged to enable the operator to get the desired speed for any given sized tap; or all may be run at any of the three speeds, if so desired, by having the necessary gears. By the substitution of the necessary gearing—which is easily done—three, two, or one of the taps can be run "left hand." The machine has a tight and loose pulley, to accommodate itself under a main line or counter line. The necessary oil is regularly supplied by graduating cocks, a device in itself a source of economy.

Of these machines two sizes are made, No. 1 and No. 2. No. 1 machine taps from one and one-half inches down to the smallest size. No. 2 taps from two inches down to the smallest size.

These machines are arranged so as to provide against any gumming, or obstructions in the sockets from the chips or oil. The sockets for holding the taps are made so that any tap will fit and work in or on any spindle. The nuts, when finished, drop below the teeth of the tap, and when the tap is full it can be removed and replaced without stopping the machine.

With these machines nuts of the same or different sizes may be cut as rapidly as one man can put them on and take them off the taps. The attendant can be kept busy and at the same time run at a speed sufficiently slow to avoid destroying the tap; the motion or speed of the tap being within the control of the operator can be made fast or slow as desired; and one or any number of the taps may be used, as required.

Further information in regard to these machines may be obtained by addressing Howard Brothers, Fredonia, N. Y.



DURRELL'S NUT TAPPING MACHINE.

The Glories of the Starlit Heavens.

BY R. A. PROCTOR.

If the eye could gain gradually in light-gathering power, until it attained something like the range of the great gauging telescopes of the Herschels, how utterly would what we see now seem lost in the inconceivable glories thus gradually unfolded. Even the revelations of the telescope, save as they appeal to the mind's eye, would be as nothing to the splendid scene revealed, when within the spaces which now show black between the familiar stars of our constellations, thousands of brilliant orbs would be revealed. The milky luminosity of the Galaxy would be seen aglow with millions of suns, its richer portions blazing so resplendently that no eye could bear to gaze long upon the wondrous display. But with every increase of power more and more myriads of stars would break into view, until at last the scene would be unbearable in its splendor. The eye would seek for darkness as for rest. The mind would ask for a scene less oppressive in the magnificence of its inner meaning; for even as seen, wonderful though the display would be, the glorious scene would scarce express the millionth part of its real nature, as recognized by a mind conscious that each point of light was a sun like ours, each sun the center of a scheme of worlds such as that globe on which we "live and move and have our being."

Who shall pretend to picture a scene so glorious? If the electric light could be applied to illumine fifty million lamps over the surface of a black domed vault, and those lamps were here gathered in rich clustering groups, there strewn more sparsely, after the way in which the stars are spread over the vault of heaven, something like the grandeur of the scene which we have imagined would be realized—but no human hands could ever produce such an exhibition of celestial imagery. As for maps, it is obviously impossible by any maps which could be drawn, no matter what their scale or plan, to present anything even approaching to a correct picture of the heavenly host. There is no way even of showing their numerical wealth in a single picture.

It is not till we have learned to look on all that the telescope reveals as in its turn *nothing* compared with the real universe, that we have rightly learned the lessons which the heavens teach, so far, at least, as it lies within our feeble powers to study the awful teaching of the stars. The range of the puny instruments man can fashion is no measure, we may be well assured, of the universe as it is. The domain of telescopically visible space, compared with which the whole range of the visible universe of stars seems but a point, can be in turn but as a point compared with those infinite realms of star-strewn space which lie on every side of our universe, beyond the range—millions of times further than the extremest scope—of the instruments by which man has extended the powers of visions given to him by the Almighty. The finite—for after all, infinite though it seems to us, the region of space through which we can extend our survey is but finite—can never bear any proportion to the infinite save that of infinite disproportion. All that we can see is as nothing compared with that which is; all we can know is as nothing; though our knowledge "grow from more to more," seemingly without limit. In fine, we may say (as our gradually widening vision shows us the nothingness of what we have seen, of what we see, of what we can ever see), not, as Laplace said, *The Known is Little*, but THE KNOWN IS NOTHING; not *The Unknown is Immense*, but THE UNKNOWN IS INFINITE.—*Knowledge.*

Tenacity of Life of Bacteria.

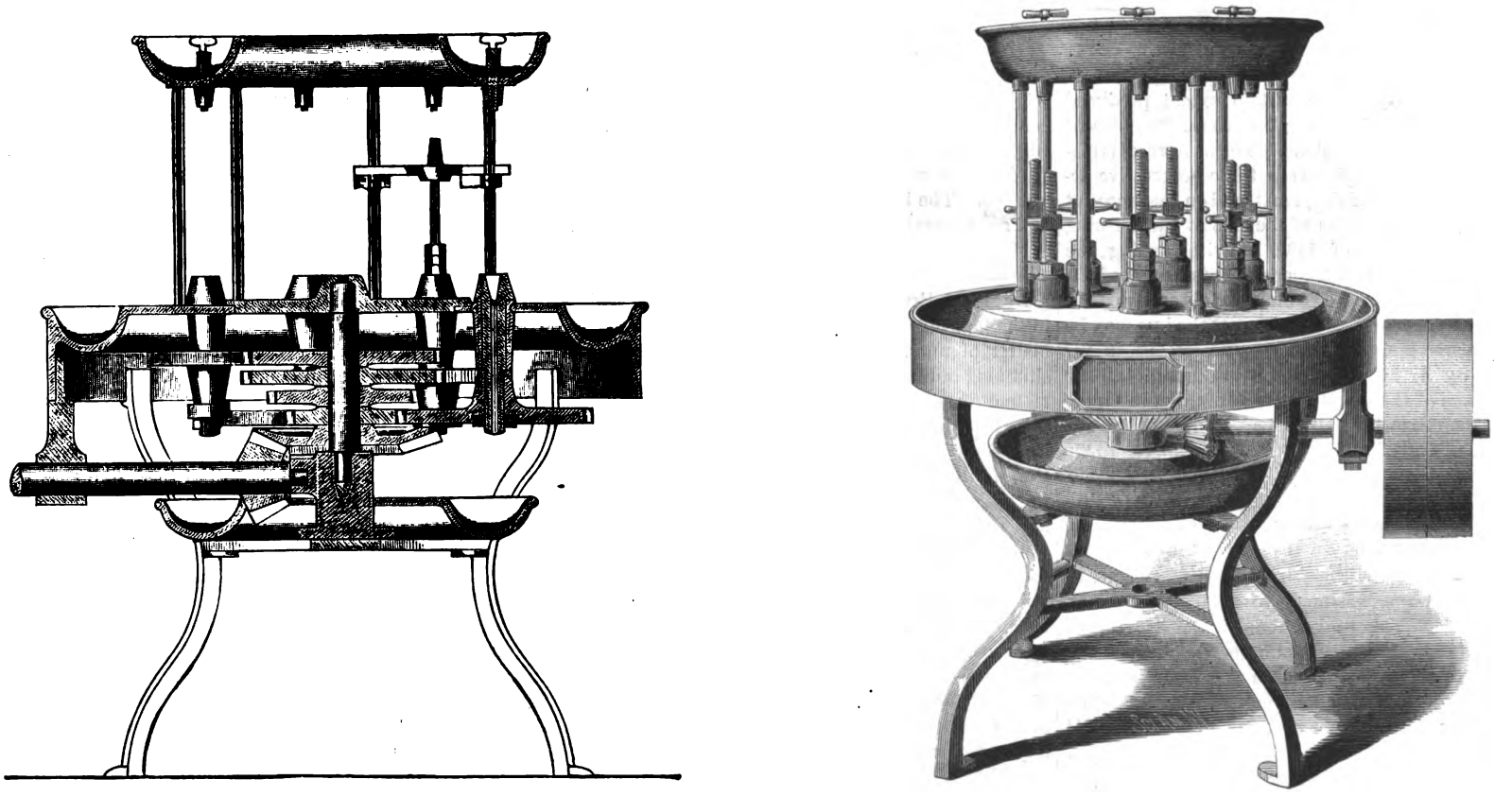
The demonstration of the intimate relation of bacteria to certain fevers and other diseases would seem at first sight to greatly simplify the work of the physician in searching for efficient remedies. Put in plain English the problem is: find some element or compound that is fatal to bacteria, and administer it in the way best calculated to reach the mischievous fungi in the patient's blood. But the problem is easier stated than solved. The lower forms of life which appear to cause the trouble are able to live and thrive under the widest possible range of conditions; so that, so far as known, any reagents that will kill them would be much more quickly fatal to the patients.

The eminent English chemist, Edward Frankland, recounted the other day, at a meeting of the Society of Arts, some experiments made in his own laboratory, showing the indifference of bacteria to conditions that would speedily destroy higher organisms.

A quantity of mutton broth was affected by bacteria, and when swarming with these organisms, it was introduced into a vessel filled with mercury, and standing over that liquid. Then various gases were put into these globes, and, of course, in contact with this liquid teeming with bacteria. Oxygen was tried, hydrogen, nitrogen, carbonic acid, and all the ordinary gases, some of which were respirative by animals, and some of which were believed to be beneficial to plants; but the bacteria seemed to delight equally in either of them. They got on quite as well in carbonic acid as they did in oxygen; they could live for weeks without the presence of a trace of oxygen in the liquid, with nothing but pure carbonic acid.

If the experiments had gone no further, they would show that these organisms had an extraordinary tenacity of life. But cyanogen was now introduced into the flasks, and, although they certainly did sicken a little under it, they recovered a little in the course of a week or so, and went on living in that gas in a fairly healthy condition. Sulphurous acid—the mutton broth itself being, of course, saturated with this gas, and the atmosphere of the glass globe consisting of nothing else but sulphurous acid—seemed to have very little effect on them at all; their motions were not stopped, and they seemed to be as lively after the application of it as before, and the same was the case with several other reagents which were tried.

It is barely possible that these vicious organisms may be reached and killed by some drug in doses which the human system can tolerate; but the prospect certainly is not bright. Prevention rather than cure seems to be the end best worth working for.



DURRELL'S NUT TAPPING MACHINE.

THE BRYANT OIL CUP, illustrated in our issue of June 17, is made by the Bryant Mfg. Co., 929 Filbert street, Philadelphia, Pa., and not at the address given in article referred to.

Where the House Fly Breeds.

As "fly time" approaches every housekeeper wonders where and how the increasing swarms of pests multiply so rapidly.

The eggs, mere whitish specks to the unaided eye, are laid in little agglutinated piles in warm manure or in decomposing vegetation, especially that about our stables and barn yards. From 80 to 100 are laid at a time, and probably at three to four different intervals by the same fly, though on this point we have no exact data. Within twenty-four hours in summer, they hatch into footless maggots, which, after rioting in filth till their tender skins seem ready to burst from repletion, become full-fed in less than a week, and descending into the earth, or sheltering under some old board, contract to brown, shining objects, rounded at both ends, and technically known as puparia. Within the darkness of this hardened skin profound changes rapidly take place, and the insect passes through the pupa to the perfect state, and finally, in about five days, the anterior end of the puparium is pushed off, and the fly quickly crawls out. At first its parts are pale and soft, and its wings are crumpled and useless, but these soon expand, and suddenly, without practice or teaching, the new fledged fly wings its way to your table to mock your displeasure—to share your repast. The length of time required from hatching to maturity varies with the season and temperature, but will not exceed ten days in midsummer, while the life of the perfect fly lasts about three weeks at the same season. As cold weather approaches propagation ceases, and the older flies perish. A few of the more vigorous females, however, retreat to some nook or cranny, where, in a state of torpor, they survive until the ensuing season—links 'twixt the summer gone by and to come. The insect may also hibernate in the pupa state in the ground. In rooms kept continuously warm, or in more southern latitudes, the fly remains active all winter, and our palace sleeping cars bring them daily to us from Florida during the coldest months of the year.

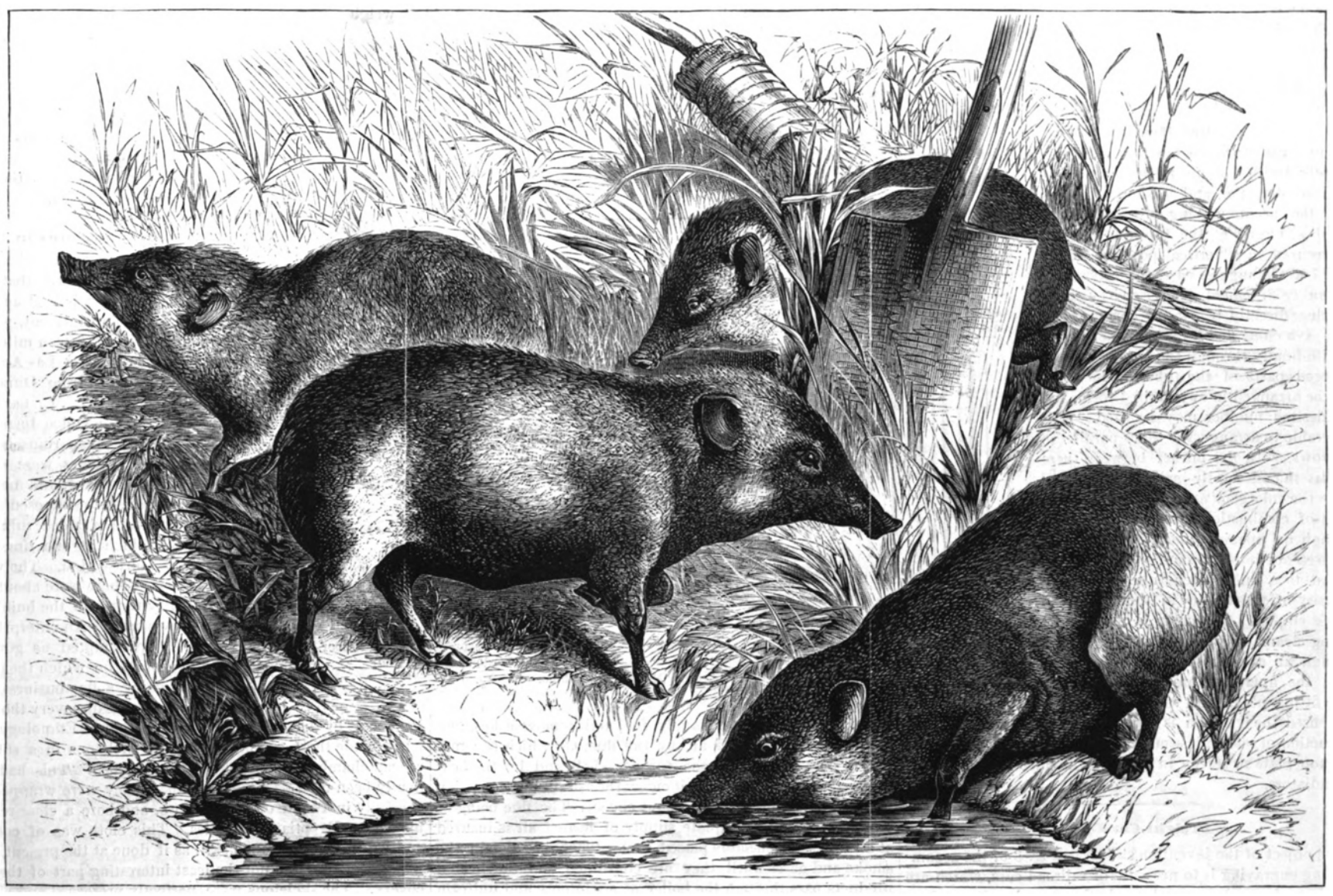
Curious Partial Loss of Memory.

An English scholar, during a holiday excursion in the Hartz Mountains, subjected himself one day to a severe physical strain, which produced a singular mental disturbance. He was on his feet from morning till night, and in the course of the day's wanderings, made several arduous ascents, taking no rest, and neither eating nor sleeping. At night, when he reached a place where he could supply his needs, he was unable, to his great astonishment, to recollect a single word of the German language, although he ordinarily spoke it with fluency. His memory did not fail him in any other respect; he knew his own language as well as ever, and recalled perfectly all the incidents of the day. As soon as he had thoroughly rested, and had eaten the food which he procured by signs, his German returned to him completely.

It is probable that such temporary aberrations of memory are more frequent than is commonly supposed; and that they may help to account for some of the otherwise unaccountable failures of men in responsible places to do their duty. An engineer, or switchman, or signalman, whose hours of labor are excessive; who has been nervously exhausted by domestic anxiety or bereavement; or who has criminally wasted his strength by dissipation or lost his sleep by unwise frolicking, is liable at any moment to forget the simple duty upon the right performance of which may hang the safety of hundreds. If it were not for the fortunate circumstance that routine duties become so wrought into the organism that men will perform them automatically, the overtaxing of men's energies by corporate selfishness, or individual misfortune or folly, would much more frequently result in disaster.

THE PYGMY HOG OF NEPAUL.

For our first knowledge of the existence of a diminutive form of the pig family in the Sub-Himalayan forests we are indebted to the researches of Mr. Bryan H. Hodgson, formerly resident at the Court of Nepaul, who described the pygmy hog so long ago as 1847, in an article published in the Journal of the Asiatic Society of Bengal. He named it Porcula Salvania, from the forests of Saul trees (*Shorea robusta*) in which it is chiefly found. While the wild boar, or a species closely resembling it, abounds all over India, the pygmy hog is exclusively confined, as Mr. Hodgson tells us, to the deep recesses of the primeval forests, where it roams about in herds. It is very rarely seen, even by the natives. A well known hunter informed Mr. Hodgson that during fifty years' abode in the Saul forests he had obtained but three or four of these animals to eat, partly owing to their scarcity, and partly to the speed with which the females and young disperse, and to the extraordinary vigor and activity with which the males defend themselves while their families are retreating. Dr. Jerdan, in his volume on the Mammals of India, tells us that the full-grown males live constantly with the herd, which consists of from five to twenty individuals, and are its habitual and resolute defenders against harm. These animals feed principally on roots and bulbs, but also devour birds' nests, eggs, insects, and reptiles. The female has a litter of three to four young ones. Dr. Jerdan adds that, while at Darjeeling, he in vain endeavored to procure a specimen from the Sikkim Terai, and Sir Joseph Fayrer, who hunted many years in the Terai, was also unsuccessful in meeting with the pygmy hog. Under these circumstances, it will be readily understood that the authorities of the Zoological Society of London have been much pleased at the recent acquisition of a small herd of these animals, consisting of a male and three females, of which we give an illustration. They were obtained in the Western Dooars of Bhootan by vast trouble and expense, and were brought to England by Mr. B. H. Carew, who has parted with them to the society. They were caught by Mr. Carew's hunters in snares, which were set for them in hundreds, over a range of country twenty miles in extent. Though, on their first arrival, they were very wild, they are already becoming tame and confidential. In its general appearance, the pygmy hog is not unlike a small variety of the common boar; but measures only about two feet in length, and has a very small tail. The color is a nearly uniform brown, slightly shaded with dirty amber. The coat of hair is thin, except upon the back. The pygmy hogs will be found by visitors to the Zoological Society's Gardens in what is usually called the "Ostrich House," just beyond the Zebra House, where a compartment has been specially fitted up for their accommodation.



PYGMY HOGS FROM INDIA AT THE ZOOLOGICAL SOCIETY'S GARDENS IN LONDON.

Electric Lights in Sea Fishing.

A French paper reports a trial by government permission of an electric lure for sea fish. It consists of an electric light in a glass globe with a device for sinking it to the desired depth. As soon as the light is turned on the sea in its vicinity is illuminated brilliantly, and the fish, over whom light is well known to exercise an irresistible influence at night, come eagerly, and sometimes in large schools, within the rays. They may be seen from above disporting themselves in the unaccustomed brightness, and little dreaming of the sinister purpose with which the little fete is organized for them. It is then that other fishing boats, armed with nets, come up and set to work at the unconscious victims, which they surround as well as they can without interfering with the apparatus connected with the lighted globe. It may be supposed that this device is calculated to operate with much deadly effect whenever it is used; and there seems to be much doubt whether it will ever be allowed as a recognized kind of fishing within territorial waters. Indeed, the license granted by the government is said to be merely provisional, and for the purpose of testing the new machine.

Railway Construction in 1882.

What effect the strikes of the ironworkers may have upon railway construction during the rest of the current year cannot be told; thus far the work has greatly surpassed that of last year, when the increase of mileage—between 9,000 and 10,000 miles—exceeded that of any previous year. Indeed, during the first five months of the year the increase was more than double that of the corresponding months of 1881. According to statistics compiled by the *Railway Age*, in 36 States and Territories, on 120 roads, no less than 3,480 miles of new railway were laid down during the time mentioned.

A Canadian Land Speculation.

A syndicate of English and Canadian capitalists are negotiating with the Canada Pacific Railway syndicate for the transfer of the rights of the railway company to some millions of acres of land in the Canadian northwest. The Duke of Manchester, now in Winnipeg, is said to be at the head of the gigantic speculation. It is reported that to encourage emigration the land company will erect houses for settlers. The railway company's land grants cover 10,000,000 acres.

RECENT INVENTIONS.

Farm Gate.

An inexpensive metallic barbed wire gate, the wires of which are self-tightening, is shown in Fig. 1 in the annexed drawing. The gate is provided with a novel and efficient means for opening the gate from either side and for locking the same when closed. A is a bent rod or bar, the upper and lower ends of which are turned outward and enter the post as shown. One end of each of the barbed wires is wrapped around this rod at its bends and is adapted to slide slightly upon the rods when the gate is opened and closed. The forward ends of the wires are secured in an upright piece, which is braced by a diagonal rod that reaches from the upper end of the bar to the lower end of the bent rod, and the short brace which reaches from the center of the upright bar to the diagonal brace. The lower end of the diagonal rod is formed into an eye that surrounds the rod, A, and between this eye and the lower end of the rod is placed a coil spring, which causes the rear end of the gate to move upward upon the rod when the gate is opened. The rear ends of the barbed wires are tied together by a stiff wire looped around them all, so that when the gate is opened all the wires will be caused to slide upon the bent rod, and to prevent bending of the rod, A, from the weight of the gate, wires are wrapped around the rod at different points and secured to the gate post. The upright bar at the front end of the gate is triangular in form, and on its side toward the gate post is a rod formed with a loop on the upper end that fits over a staple in the top of the post, and at the lower end is a projection which rests upon a yoke which is hinged to the post, and by these and connecting devices the gate is held to the post and released and the barbed wires are kept taut. This invention has been patented by Mr. S. S. Durbon, Junction City, Kan.

Gas Heating Stove.

A new gas stove for heating purposes has been patented recently by Mr. John H. Baumgardner, of Lancaster, Pa., and is shown in Fig. 2 in the accompanying cut. A series of tubes, closed at the top and bottom, are secured in a vertical position in the top of a rectangular case, the tubes having an enlargement preferably made tapering directly below the cover of the base. An elongated Bunsen burner passes longitudinally through the base below the enlarged parts of the tubes. The tubes may be arranged in any desired form, and any desired number may be used. It is preferable to arrange the tubes parallel in two rows, with the burner between them so that the outwardly inclined flame will strike the enlargements of the tubes. The gases of combustion pass out of the base through an opening, and may be permitted to escape into the room or may be conducted to a flue. Each tube contains a quantity of water, and in the rest of the tube is empty. A vacuum is obtained by raising steam in the tubes until it escapes through an aperture in the top of each tube; the apertures are then closed by close fitting plugs, and when the steam is condensed the vacuum is created. By this means a rapid production of steam is secured. The tubes may be covered by a top plate or screen in the same manner as steam heating radiators.

Freight Car Door.

The object of the invention shown in Fig. 3 of the accompanying engraving is to provide for railroad cars, which are used both for carrying grain and other merchandise, a door that can be easily opened when the car is loaded with grain, and can be moved and held out of the way while the car is being filled with other freight. The invention has been patented by Messrs. Thomas McNally and William H. Glasgow, both of St. Louis, Mo., and it consists in a door made shorter than the width of the doorway, and provided with a sliding plate operated by a lever for locking and unlocking the door, the door being adapted to swing bodily outward when unlocked, from the pressure of the grain against it. The door is suspended from a long rod placed inside and near the top of the car, by ropes or chains and sliding blocks, the blocks being adapted to slide on the rod for moving the door to one side of the doorway, and the ropes or chains are used for elevating the door. In use, if the car is loaded with grain, to open the door it is only necessary to raise the locking device and throw the lever back, thus disengaging the holding plate from the door and leaving it free to be forced bodily out of the doorway of the car by the weight of the grain inside, thus obviating the task of lifting the door with the weight of the grain against it. If the door is to be put out of the way while the car is being loaded with other freight than grain, it is first elevated by the chains in the sliding pulleys, and then pushed to one side on the sliding rod, where it is retained out of the way.

An Improved Farm Gate.

The invention shown in Fig. 4 of the accompanying engraving is a new sliding gate that is simple in construction and can be opened and closed without great exertion. The gate can be made of boards or slats as may be desired, and is designed to slide parallel with the fence. To guide the gate in this movement a guide post is provided between which and the fence the gate slides. The outer end of the gate fits into a vertical slot in the gate post, E. Two bars, F and G, are pivoted at their lower ends to the bottom of the fence, the bar, G, being of greater length than F. These bars are connected by a longitudinal bar that is pivoted to bar, G, a short distance from its top, and to the top of the bar, F, and extends beyond it. Two suspension bars attached to the bottom of the gate are pivoted to the longitudinal bar, one at its outer end, and the other between the pivots of the bars, G and F. An inclined connecting bar is pivoted to top of the bar, G, and to the front suspension bar, a short distance below its end, so that it crosses the longitudinal bar as shown in the engraving. When the gate is drawn back it is raised upon the suspension bars and slides back easily. For further information address Messrs. Nicol & Watson, Owen Sound, Ontario.

An Improved Boiler Furnace.

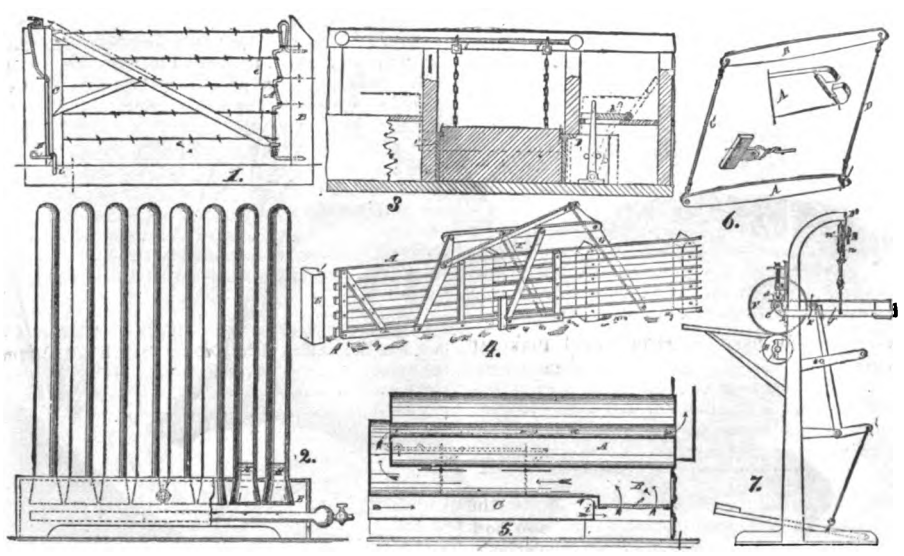
The object of the invention shown in Fig. 5 of the engraving is to obtain perfect combustion of fuel in furnaces, and consequently to insure economy of fuel. The waste heat of the furnace is used to heat the air supplied to the fire box, and the gases and smoke are detained until they are consumed. This is the invention of Mr. Girard R. Ricketts, of Proctorville, O. A is the boiler, which is of ordinary construction, and B is the fire box connected by a flue beneath the boiler with the smoke box, and provided with doors, grate bars, ash pit, as usual. The furnace shell is surrounded by an outer casing, by which a flue, C, is formed at the sides and bottom of the furnace, communicating at the front with the ashpit, where the inlet is narrowed by a bridge, and at the rear end is open for the free admission of the air. In operation the doors of the fire box and ash pit are kept closed except when it is necessary to supply fuel and remove ashes, and the fire is supplied with air by the flue, C, which becomes heated by contact with the furnace shell and by the heat radiated therefrom, so that it enters the ash pit in a condition for insuring combustion without check. The flue being of large capacity, an adequate supply of heated air is insured at all times. Deflectors placed under the boiler detain the smoke and gases until they are consumed, and the heated products pass through the boiler at an intense and uniform heat.

Hay and Cotton Baling Band.

An improved and novel baling band, that can be closed and locked or unlocked and unclosed very rapidly and conveniently, has been patented by Mr. William S. Gordon, of Princetown, N. Y., and is shown in Fig. 6 in the accompanying engraving. Two bars or slats, A, B, made of wood or metal, are united at their ends by wires, ropes, or chains, C D. The bars are preferably made wider at their middle, so as to make them stiffer and stronger. The ends of the wire, C, are firmly attached to the corresponding ends of the bars, and one end of the wire, D, is firmly attached to the opposite end of the bar, B. The bar, A, is provided with a transverse slot, a short distance from the end opposite the one attached to the wire, C. Grooves are cut in the outer surface of the bar that extend from the end of the slot to the edges of the bar, and a slot extends from the end of the bar to the transverse slot and at right angles to it. A T-shaped key has its shank or lug attached to the free end of the wire, D, and the inner edge of the key is slightly beveled to adapt it to fit into the grooves on the top of the bar, A. When the band is used the bars are placed on the top and bottom of the bale, and the free wire is drawn so that it can be passed through the slot in the end of the bar, and the key is turned so that the shank will rest in the transverse slot and the inner edge in the grooves on the top of the bar, thus locking and holding the band. The operation is reversed to unlock it, and the band may be used a number of times, as none of the parts are broken.

Leather Measuring Machine.

Mr. William A. Sawyer, of Denversport, Mass., has patented a new and ingenious machine for rapidly and accurately measuring sides of leather and other similar surfaces having irregular edges. It is shown in Fig. 7 of the engraving. The main frame of the machine is composed of upright pieces which are tied together by cross pieces, and upon the uprights are secured bearings in which the shaft of the power roller, B, revolves, and above these blocks are bearing blocks to which the shaft, C, is attached. Secured to the cross piece is a series of depending arms, each of which carries a grooved roller, *d*, and the lower ends of these arms are formed with perforated enlargements through which the shaft, C, passes. Upon this rod and between these arms are placed a series of loose wheels, F, which normally rest upon the roller, B, and receive their motion therefrom. There should be a sufficient number of these wheels to reach over the greatest width of the surface to be measured. The hubs of these wheels are grooved to correspond with, and are arranged immediately under the wheels, *d*, for grasping the rods of weights, for the purpose of moving them over the roller, *k*, of the suspended frame, J, across which roller they are fulcrumed When a side of leather is to be measured it is passed between the power roller, B, and the wheels, F, under the series of which any portion of the leather passes, will be raised up by the thickness of the sheet, causing the hubs of the wheels to grasp the rods of the weights and draw them forward over the roller, *k*. The number of wheels raised correspond with the number of weights moved, and the width of the surface and the distance the weights are moved correspond to the length of surface passed under the wheels respectively, and it follows that the position of the weights, after the surface has passed entirely through the machine, will indicate the exact extent of surface in the sheet irrespective of its shape. The aggregate of the movement of the weights is indicated by a registering dial, the pointer of which is operated by suitable intermediate mechanism between the suspended frames, J, and the dial.



1. Durbon's Farm Gate.—2. Baumgardner's Gas Heating Stove.—3. McNally and Glasgow's Freight Car Door.
—4. Nicol and Watson's Farm Gate.—5. Rickett's Boiler Furnace.—6. Gordon's Baling Band.
7. Sawyer's Leather Measuring Machine.

Discovery of Ancient Ruins in New Mexico.

The Boston *Journal* reports that important discoveries of the largest ancient ruins yet found on this continent, which extend for a distance of fifteen miles up and down the banks of the Las Animas River, about forty miles from Durango, in Rio Grande county, N. M., have recently been made. Post Office Inspector Cameron, who visited these ruins lately, believes the ancient villages were occupied by the Moqui Indians, and not by the Aztecs, as is generally supposed. He speaks of discovering a stone ruin 400 feet by 450 feet, which at one time evidently was three stories high. The walls are five feet thick. There were about one hundred and fifty rooms in the building, of ten feet square each. An enterprising Yankee who has pre-empted as government land the ground on which the ruins stand, has been doing a fine business selling relics to visitors. A discovery thought important by the gentlemen of the Bureau of Ethnology was lately made there of thirteen human skeletons in a subterranean chamber of the building mentioned. This had evidently been used as a burial vault. They were wrapped up carefully in a kind of coarse cloth, and bore a close resemblance to Egyptian mummies. This cloth was of cotton, and woven with as much skill as if done at the present day, which is considered not the least interesting part of the discovery. The skeletons were perfectly preserved and clean. They were unmistakably those of Indians. A quantity of pottery of the best make was also found in this tomb.

An Artificial Moon.

Take a soup plate and slightly grease the surface with lard or oil; distribute irregularly in varying thicknesses about a tablespoonful of so-called granulated citrate of magnesia. Take a basin, pour in enough water to fill the soup plate; shake into the water about two-thirds the quantity of fine freshly burnt plaster of Paris, which will sink at once; pour off nearly all the superfluous water; stir two or three times with a stick or spoon, so as to mix irregularly the paste; then pour it on the powder in the soup plate. The water in the plaster will cause an immediate disengagement of carbonic acid gas, which will rise in bubbles of various sizes through it in irregular patches; the plaster almost immediately setting, the shape of the outline of the bubbles and the walls of them become fixed, and, as a result, a most startling resemblance to the cratered surface of the moon is produced.

If a photograph of this be taken with a strong light, the resemblance becomes so perfect as to deceive almost all who are not professional astronomers. I believe that a little sugar, or sirup, or gum in the water would produce larger craters, but I have not tried this.

A. STEWART HARRISON.

[As we have for several years used illustrations of the moon's surface formed by Mr. Harrison in the way described above, we can vouch for the accuracy of his statements.—ED.]—*Knowledge.*

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.

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) J. L. H. asks: Will it take a greater length of piston rod to drill the crank pin of an engine from one dead center to the top quarter than it will to drive it from the top quarter over to the other dead center, and if so, why? A. It takes more motion of the piston to make one half of the revolution of the crank than the other, the difference depending upon the length of the connecting rod.

(2) C. W. asks: Where and how long the longest draw bridge is in the United States? A. The longest draw or pivot span is, we think, in the bridge just completed over the Harlem River, connecting with the New York and Northern Railroad. The whole length of pivot span, 300 feet, and the pivot pier, 60 feet, giving a clear passage of 120 feet on both sides of pier.

(3) E. G. M. asks: 1. How can I make an electric battery small enough to carry in the pocket, and strong enough to give a sensible shock? A. Use one of the forms of bichromate battery with a small induction coil and interrupter. 2. What is the best easy system of short-hand writing? A. Phonography is most used. See SUPPLEMENT, No. 316.

(4) F. J. R. asks how to compute the horse power of an upright tubular boiler, also horizontal return flue boiler. A. For upright tubular boiler allow 18 to 20 feet heating surface per horse power; for return flue 12 to 14 feet per horse power.

(5) W. M. F. asks: Is all lead pipe made by hydraulic pressure, or can it be made by any process but the one? A. All lead pipe is now made by hydraulic pressure, up to about four inches diameter. Soil pipe is sometimes made by turning up sheet lead and burning or soldering the seam. The only other way to make lead pipe is to cast in cylinders, and draw or roll it out upon a mandrel. This might be good for some purposes where straight, hard pipe is needed, but too expensive for ordinary uses.

(6) E. S. P. asks: Will you give us a good formula for preparing gunpowder from charcoal, sulphur, and niter? A. The composition of powder is varied considerably to adapt it to special usage. Theoretically the proper composition for a powder in which the full force of a completed reaction between the ingredients employed would take place, would be:

Niter (pure)	74·64
Carbon (pure charcoal)	13·51
Sulphur (pure)	11·85
	100·00

In practice, however, the following are found best adapted for the several purposes indicated:

	Niter.	Charcoal.	Sulphur.
For U. S. military service.	76	14	10
For sporting.	78	12	10
For blasting	62	18	20

Of course much depends upon the thoroughness with which these ingredients are mixed together, granulated, and dried.

(7) W. C. B. writes: 1. We have been using for about two weeks some cotton seed oil for cooking purposes, and like it so far better than lard, but somebody has told the women folk that it is not safe to use it, that it is poisonous. Is there any danger in using this oil? It is made at New Orleans, and it is claimed by the merchant who sells it here "that it was made expressly for cooking purposes." A. Pure cotton seed oil is quite as wholesome as lard. 2. I have a mechanical telephone line, about one-quarter mile long, between my house and office. It is No. 20 copper wire, suspended from poles, trees, etc., by twine, and the wire goes through holes in the walls of house and office, and is attached at each end to a button on a sheepskin diaphragm in a wood frame. It passes at one place under and within about two feet of a telegraph wire. I wish to know if there is any danger of lightning from it; and if there is, would the danger be increased or diminished by connecting the wire to the (iron) pipe of a driven well at one end, a "ground" at the other end? A. There is a possibility of danger from lightning which might be averted by grounding your line as you propose. 3. I am superintending, without pay, the putting up of a town clock in our court house steeple. It will have four five foot dials, and I would like to know whether or not the hands would show in the night if I had the dials painted with phosphorescent paint. One of the leading clock firms in New York says not—says the paint is a humbug. Another firm indorses the paint. I do not know anything about it, but if I knew it would illuminate the dials so that the hands could be seen at night, say four hundred yards, I would put it on the dials at my own expense. A. Some of our dealers in paints are now selling a fair article of phosphorescent paint or varnish. These phosphorescent coatings could hardly be depended upon to illuminate such a dial sufficiently to show time in the dark at four hundred yards.

(8) W. H. J. writes: Some of us have had quite an argument about a "siphon." Suppose a pipe were made perfectly air tight, and one end of this pipe be placed below the surface of a body of water, and from thence up an incline mountain, to a height of two or three hundred feet above the body; then down on the opposite side of said mountain to a distance of about seven or eight hundred feet below the level of the above mentioned body of water; this line to be charged full of water at the highest point, and being air tight. When opened at each end at once, would the heavy column siphon the water over and down to the lower level in one continuous stream? A. A siphon will not operate over an obstruction or embankment exceeding about thirty feet in height, above the surface of the water to be discharged.

(9) P. asks for the best known ointment or mixture to put on exposed parts of the body to keep mosquitoes from biting. A. Camphorated glycerine is perhaps the best.

(10) F. P. C. writes: I am carpenter in a city mill, and the engineer and myself have had a dispute regarding the running of belts. I claim that if two pulleys are out of line with each other connected by a straight belt that the belt will run to the low on short side of the pulley. He says not, that the belt will follow the high on long side. A. Belts will run toward the ends of the shafting that are nearest to each other, or down hill, or toward the low side. On pulleys that are crowning the belts run toward the high part, which is the center, and therefore stay in their proper place, notwithstanding small errors in lining the shafting. When the pulleys are slightly conical, the belts will run toward the high or largest side of the pulley. Sometimes pulleys will wear more on one side than the other and dispose the running of the belt towards the high side, and may be economically corrected by altering the line of one of the shafts, so that the end of the shaft on which the wear takes place shall be nearer to the other shaft. But this is not recommended as good engineering.

(11) H. S. asks: 1. Is a single three-quarter inch stay bolt sufficient for a steam drum head? Drum is 2 feet diameter, of the horizontal style, connecting two boilers; the stay extends from the bottom of drum to center of head; head is of best flange steel; amount of steam, 85 pounds. A. No. You should have at least three stays, seven-eighths inch diameter. 2. Would a common alcohol lamp and blowpipe produce heat enough to braze iron, say one-quarter inch diameter? A. Yes.

(12) C. A. writes: I have seen in "Answers to Correspondents" in the New York *Sun* (I think in February), that the North Star is fixed a star. I am sure it revolves in a small circle about two degrees in the same time that the Great Bear makes its revolutions around it. Looking at it at a difference of six hours, there is an apparent change in the altitude. A. The so-called North Star does not coincide exactly with the North Pole of the earth. It is distant 1° 32′ 39″ from the true pole, and apparently sweeps around the true pole in a circle of 3° 5′ 18″ diameter. It comes to the meridian with Alioth in Ursa Major, or the third star from the end of the tail of the Great Bear. When Alioth is on the meridian *above*, the Pole Star is 1° 32′ 39″ below the true pole.

(13) M. L. S. asks: Is there any two liquids (or chemicals) neither of which when used separately will eat through paper, but yet will, when one is applied to the paper in certain spots, and the entire paper afterward washed with the other, cause the paper to be eaten through in those spots, leaving the rest uninjured? A. We know of no such liquid or combinations of liquids.

(14) A. F. E. asks: Does the friction of the shot or load against the barrel of a gun cause an increase of the recoil? If so, why? A. Yes; as the greater the resistance to the issue of the ball or shot, the greater must be the recoil pressure.

(15) H. B. and C. ask: Which will be most economical practice: A shaft is to be driven at 60 revolutions per minute, engine and main shaft 50 revolutions per minute, to gear from main shaft with wheels, 60 cogs on it to 48 cog pinion, on the driven shaft (to run 60 revolutions) or speed engine, and main shaft up to 75 revolutions, and gear from the 48 cog on main shaft to 60 cog on driven, the driven shaft to supply the same power in both cases, and steam pressure to be the same? Suppose the same case, which would be best: to reduce the steam pressure proportionate to the gain in power, by the increased speed and leverage of gearing, 48 to 60 cog, if you decide that the high speed is most economical? We have three or four times as much power as we desire to utilize at present, and want to know the most economical way to run the engine and get the specified speed, 60 revolutions, and are compelled by circumstances to use wheels of that proportion. A. Where there is, as you say, plenty of power, the most economical practice is to speed your engine to 50 revolutions per minute, arrange your gear 60 to 48 for the speed of the driven shaft, and carry the pressure in the boiler just high enough for the work. If you can do this with not more than 50 pounds pressure in the boilers, you will save the wear and tear of high speed engines, save oil, and save much fuel.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

June 6, 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.

Air injecting ventilator, P. Mihan	259,035
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NEW YORK, June 15, 1882.

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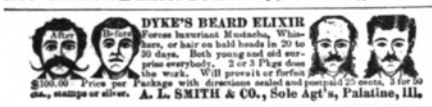

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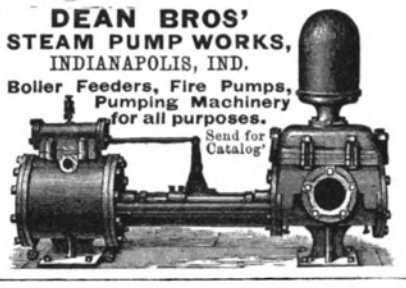

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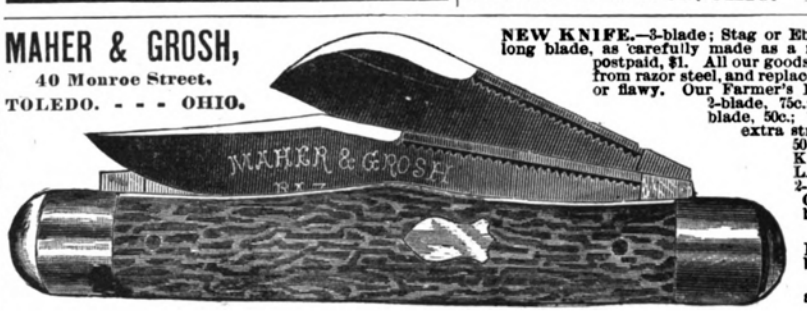

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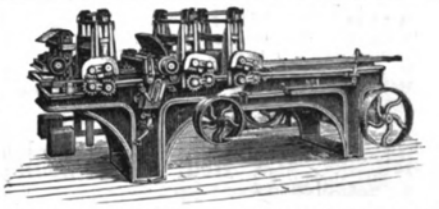

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