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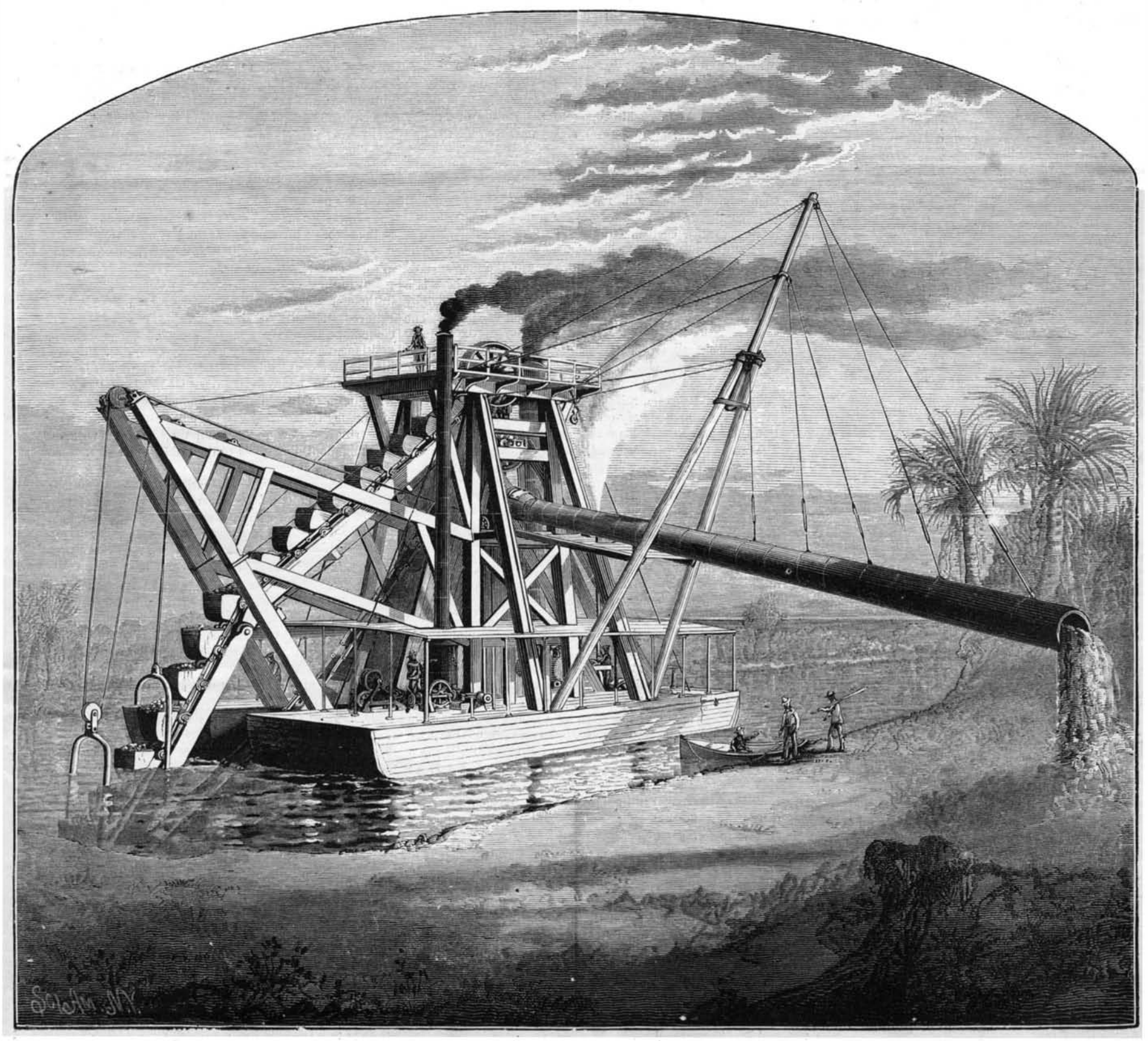
MONSTER DREDGE FOR THE PANAMA CANAL.

Our engraving represents the first of three great dredgers that are shortly to be set to work upon the excavation of the Panama Canal. The contract for the ten miles of marsh work, beginning near Aspinwall, has been taken by Slaven Brothers, 50 Vesey Street, this city; the great machine is almost ready for operation, and is believed to be the most effective of anything in the same line. It is built under the patents of Messrs. H. B. Angell and H. H. Lynch. The machinery of the dredge is mounted on a scow one hundred feet long, sixty feet wide, and twelve feet deep. There are eight engines, arranged in four pairs, for operating the machinery. The main engines are for driving the buckets which do the digging, and are of 250 horse power, having Myers' adjustable cut-off. The belt from the engine runs to the top of the bucket tower to a pulley eight feet in diameter, which drives compound driving gear, connected with the upper tumbler shaft, which is ten inches in diameter. This shaft moves a thirty-six inch square drum, over which the buckets pass when they dump their load into the hopper. The bucket tower is forty-five feet high above deck. There are thirty-eight buckets with a capacity of one and a half cubic yards each. From sixteen to eighteen buckets full of dirt per minute are discharged into a hopper attached to a cast iron elbow near the top of the tower. This elbow is five feet four inches in diameter where it connects with the hopper, and thirty-six inches in diameter where it connects at the lower end to the discharge pipe, which is attached to the elbow. This pipe is made of boiler iron and is one hundred and fifty feet long. The distance the mud falls, the position in which it strikes, and the inclination of the discharge pipe give the mud a velocity of from 1,300 to 2,000 feet per minute through the pipe, according to the kind of material which is being dug and discharged. The discharge pipe is supported by a derrick which stands on the scow. Water is pumped into the hopper by a pair of ten inch pumps from the canal through a seven inch pipe which passes through the bottom of the boat and extends to the hopper, at top of bucket tower. A second pair of engines of thirty horse power raise and lower the ladder that supports the buckets; they are attached to a drum for that purpose. There is a hinged joint in the ladder, outside of the derrick, for the purpose of operating one section of ladder independent of the other. A half inch cable connects the drum to the outward end of the lower section by two bales. The endless chain to which the buckets are attached is made of horseshoe iron 1⅛ inches by 9 inches. Another pair of spud and gypsy engines of thirty horse power is used for raising the spuds and feeding the buckets. The dredger rests upon the spud, upon which it can be revolved without stopping the dredging buckets, thus enabling the operators to dig from side to side at will. A chute connects with the hopper and is boarded on the sides to prevent the mud or water from falling upon the deck. The fourth pair of engines, also of thirty horse power, is connected to a windlass for snag pulling. The engines are all supplied with steam from one set of three boilers, and will require only about two tons of coal each day. Six men, including a superintendent, run the entire machine. Capacity of the dredger, 1,000 cubic yards per hour.

The cutting of the canal is to be 100 feet wide at the bottom, 185 feet at the top, and 27½ feet deep.

The dredger is now in Philadelphia, and before going to Aspinwall, tests will be made with it in the Delaware River.

PROFESSOR YOUNG, of Princeton College, said in a recent lecture: "Take a railroad from the earth to the sun, with a train running 40 miles an hour without stops, and it would take about 265 years and a little over to make the journey." He estimates the fare a cent per mile to be $930,000. These figures will be apt to hurt the excursion business on that line.



"HERCULES" DREDGER FOR THE PANAMA CANAL.

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NEW YORK, SATURDAY, MARCH 3, 1883.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 874,

For the Week ending March 3, 1883.

Price 10 cents. For sale by all newsdealers

CURIOSITIES OF THE RAILWAY CENSUS.

According to the census railway returns for 1880, there were 1,165 companies, having, in round numbers, 87,000 miles of railways in operation in this country—an aggregate almost equal to a track extending four times round the world.

The cost of this gigantic system was nearly five thousand six hundred and sixty millions of dollars, of which about two-fifths has been paid for and the companies are in debt for the balance. In the good time coming, when this enormous debt of over three thousand millions of dollars is paid off, and the interest thereon ceases, it is probable that railway speeds will be improved, traveling rendered safer, and the charges for freight and passage reduced.

The mortality upon our railways is frightful to contemplate. According to the census returns, the killed and maimed for the single year of 1880 formed an aggregate of 8,215 persons. If the companies were compelled by law to pay an average of say five thousand dollars for every person killed or injured, only a short time would elapse, probably, before this dreadful account would be reduced almost to nothing. There are very few railway accidents that might not be prevented if real care were exercised and the best safeguards adopted. The passage of a law subjecting every company to the payment of a substantial fine for every accident that takes place upon its property would doubtless stimulate the managers to give more attention to the safety of life and limb than they do at present.

The demand upon our inventors for the discovery of new and better means for saving life and preventing accidents upon railways increases every year, in a ratio even greater than the augmentation of tracks, because the population is more rapidly increasing, and the present railways are not employed at anything like their full capacity.

The freight carried in 1880 was two hundred and ninety-one millions of tons, for which the railways charged $1.29 per ton per mile, and made a profit of 53 cents per ton per mile.

The number of passengers carried was two hundred and seventy millions, for which they each paid an average of 2·33 cents per mile, and the companies made a profit of 0·62 cents per mile. If the passengers are counted by weight, allowing 14 passengers to the ton, then the receipts of the companies for their two-legged freight was $32.62 per ton per mile and their profit was $8.68 per ton per mile. This large profit, when set opposite to the small amount of 53 cents profit per ton realized from dead freight, seems to indicate that a great field is open to the genius of railway managers in devising ways and means to encourage the people to travel.

The haulage of our railways now employs over seventeen thousand locomotives, and the aggregate cost to run them, such as fuel, water, oil, repairs, and engineers, is about ninety millions of dollars, or not far from five thousand dollars a year for each machine. The item of fuel alone is thirty-three millions of dollars. The larger portion of the fuel is wasted; much of it is blown out of the smoke stack unconsumed in the form of smoke and dust. There is a grand chance for inventors to improve the locomotive by discovering means to lessen its wastes and expenses. The same remarks apply to the other branches of the railway rolling stock, consisting of over twelve thousand passenger cars and about four hundred thousand freight cars. In the year 1880 it cost the railway companies fifty-five millions of dollars for repairs for rolling stock. Is it not possible for inventive genius to study out some new mode of construction that shall reduce this enormous loss?

Our next issue will contain a variety of figures from the railway census, which will be found interesting and instructive.

THE WRINGER BEFORE CONGRESS.

A petition for the revival and extension of the old rubber wringer machine is now before Congress. This patent has a curious history. September 19, 1848, John Young, then of Amsterdam, N. Y., obtained a patent for a washing machine with the following modest claim: "What I claim as my invention and desire to secure by letters patent is, the combination of the conical rollers with the hinged platform, for the purpose of rubbing the clothes and squeezing the water out of them at the same time as herein described." Not a word is here said about elastic rollers or the use of rubber for the wringing of clothes. It is simply a washing machine in which rolls are used to rub and squeeze the clothes, and thus clean them. This patent was granted for fourteen years, and expired September 19, 1862. But under the provisions of the law as it existed when the patent was granted, the Commissioner, in 1852, extended the patent for seven years, which prolonged the life of the patent until September 19, 1869, when it expired, and since that time has remained public property, subject to free use by everybody.

July 30, 1861, while the patent was still in force, the owners obtained from the Patent Office, under the pretence of correcting "inadvertent errors" in the original, a reissued or corrected patent with the following new claims:

"1st. The combination of the rollers with the hinged platform for the purpose of rubbing the cloth and squeezing the water therefrom, substantially as and for the purposes described and specified.

"2d. The employment and use of elastic rollers which shall readily yield to any inequalities in the clothes passing through them, and thereby prevent injury, substantially as and for the purpose specified.

"3d. The employment of the conical rollers for producing a rubbing as well as squeezing motion on the clothes passing between them, whereby the operation of washing is greatly accelerated, substantially as and for the purposes described and specified."

New matter appears to be here introduced into the claims, and for the first time we have the suggestion of elastic rollers; but nothing about wringing machines.

January 6, 1863, the Patent Office granted a reissue of the reissued patent, and, as it now appears, unlawfully extended the scope of the patent. By the new reissue the patent was divided into two parts, and practically two separate patents were granted, the claims of which were as follows:

"Reissue 1,384.—Claim: 1st. The pressure rollers in combination with the hinged platform, operating as described for the purpose set forth.

"2d. The conical rollers for producing a rubbing as well as a squeezing action upon the clothes, as described.

"Reissue 1,385.—Claim: The application of India-rubber or other elastic gum impervious to water, substantially in the manner and for the purposes described, to the rolls of machines for washing and squeezing clothes."

The claim in the last mentioned patent, it will be noticed, covers the broad idea of applying India-rubber or other elastic gum impervious to water to the rolls of machines for washing and squeezing clothes. Its grant was a violation of the law, which only permits the correction, by a reissue, of inadvertent errors.

But in those early days of patent progress nothing was more common than for the Patent Office to allow any claims that any strong and rich monopoly asked for; so the rubber wringer patent was allowed.

In the light of the decisions of the Supreme Court of the United States made at sundry times during the past five years, it seems to be quite clear that the various reissues of the Young patent were unlawful, and could not now be sustained in the courts.

In the case of E. Miller & Co., in 1882, the Supreme Court of the United States decided that while a patentee had the right under the patent law to ask for a reissue to correct an error of inadvertence in the patent, he must make his application for reissue promptly, and the right to have it corrected was abandoned and lost by unreasonable delay. The court also decided that devices or combinations not set out in the original claims are, in law, a dedication to the public of that which is not claimed.

In the case of the Norton postal stamp case, the Supreme Court, in 1882, held that when an original patent describes and claims a specific invention, complete in itself, so as not to be inoperative or invalid by reason of a defective or insufficient specification, a reissue cannot be had for the purpose of expanding and generalizing the claim so as to embrace an invention not specified in the original.

The practice of the Patent Office is now made to conform to the tenor of these decisions, and such glaring irregularities as took place when the Young wringer reissues were granted could hardly occur.

But in the face of these decisions, Congress is now asked, in the ostensible name of the heirs of John Young, but, it is believed, in reality for the chief benefit of one of the wringer companies, to revive and again extend the patent. If the petition were now to be granted by Congress, this old and illegal patent, which has been dead and buried for fourteen years, would be revived, there would be a "corner" in wringing machines, and the monopolists would be able to extort money from nearly every family in the land, for the rubber wringer is now in common use. Rubber wringers are now abundantly supplied to the public from many factories at reasonable prices. But if this extension is granted, all these establishment must be closed, hands discharged, and thousands of dollars now invested in the business lost. We cannot believe that Congress will sanction such a scheme of jobbery.

FLORIDA EXPLORATION.

The claim of the party which crossed the Everglades of Florida last fall to be the first white men to explore that part of the State is disputed. It will be remembered that the party referred to (sent out by the New Orleans *Times-Democrat*) started from Kissimme City, traversed the adjacent lake region, descended the Kissimme River to Lake Okeechobee, and, after exploring that lake, followed its outflowing waters to the Gulf.

Mr. George O. Allen, of Fitchburg, Mass., informs us that he was one of a party of five who made the same trip in a twenty-foot sail boat, under the leadership of Mr. James Capehart, of Mt. Pleasant, W. Va., in January, 1881. Mr. Allen also incloses a long account of the trip which was printed in the *Forest and Stream*, November 10, 1881. This venturesome trip was made nearly two years before the expedition of the *Times-Democrat* started, and when the route was much more difficult to traverse, owing to the fact that at that time none of the channels had been cleared or marked, and the lately cut canal from Okeechobee to the Caloosahatchie had not been begun.

That these recent improvements of the route must have greatly assisted the later expedition is evident from the fact that a party of twenty-two gentlemen have since crossed the State in a small steamer, traversing the same region, and arriving at Fort Myers, Feb. 15.

SOME one says that there are a great many times when a glue pot in a house is a well spring of joy.

ASPECTS OF THE PLANETS FOR MARCH.

URANUS

is morning star until the 11th, and evening star for the rest of the month. He wins the place of honor in March for two reasons: he is in opposition and visible to the naked eye. On the 11th, at midnight, he is in opposition or opposite to the sun, rising at sunset and setting at sunrise. He is then in a straight line with the earth and sun, the earth being in the center, and is 1,745 million miles from us instead of 1,928 million miles—his distance at conjunction. Uranus at opposition passes to the sun's eastern side, and becomes evening star, playing the same role with Neptune, Saturn, and Jupiter, the four giant planets being on the same side of the sun, and all traveling from opposition to conjunction.

Uranus has completed his seven years' course in Leo, and has entered Virgo, which he will traverse in the same time. As his year is equal to eighty-four of our years, it takes him seven years, on the average, to pass through each constellation of the zodiac. Though when brightest, as at present, his diameter is not quite four seconds, he shines as a star of the sixth magnitude, and can therefore be seen with the naked eye. The best time to look for him is about 9 o'clock in the evening, in the eastern sky. As he rises about sunset, he will then be half way to the meridian. He is very near Beta Virginis, a star of the third magnitude in the southern wing of Virgo, and about 12° south of Denebola in Leo. A good observer, with these directions, will be able to pick up this far-away planet as a small, faint star on any clear, moonless night. An observation with the telescope is more satisfactory. An instrument of four or five inches aperture will bring him out perfectly defined as a small sea-green moon, deliciously delicate in tint, and two of his four moons may also be seen. But the two smaller ones are among the most difficult objects in the solar system to detect, and have only been certainly seen in the largest telescopes in the world.

Uranus travels from opposition to opposition again in four days and a half more than a year, the time varying but slightly till the end of the century. Therefore his opposition next year will occur on the 16th of February, the following year on the 20th of February, and so on.

The right ascension of Uranus is 11 h. 31 m.; his declination is 4° 1′ north, and his diameter is 3·8″.

Uranus rises on the 1st at thirty-nine minutes past 6 o'clock in the evening; on the 31st he sets a few minutes after 5 o'clock in the morning.

MERCURY

is morning star, and is visible to the naked eye during nearly the first half of the month. The reason for his visibility is that on the 3d he reaches his greatest western elongation and is far enough from the sun to be seen for a short time before his lesser light is quenched in the overpowering solar rays. Three conditions are necessary to obtain the best view of Mercury. He must be at his maximum distance from the sun at elongation, he must be as far north of the sun as possible, and the twilight must be short. The first and third of these conditions are fulfilled at the present time, but his southern declination is the drawback. Observers who command a view of the eastern horizon may find him on clear mornings about nine degrees south of the sunrise point, but those who hope for success must know where to look. Venus shines brightly about sixteen degrees west and a little farther south, while the first magnitude star Fomalhaut is about the same distance southeast. The best time for observation is three-quarters of an hour before sunrise, when those who are fortunate enough to pick him up will behold a brilliant white star with a rosy tint, superb in luster, and sometimes playing hide and seek, as he now disappears and now reappears in the increasing dawn that heralds the sun's approach.

On the 9th, Mercury is in conjunction with Delta Capricorni, a little star in the tail of Capricornus, passing 1° 24′ north. The conjunction may be seen with a good opera glass.

On the 17th Mercury is in conjunction with Mars, being about one degree south. The conjunction is interesting in showing how near the planets are together, though both at the time are too near the sun to be visible.

The right ascension of Mercury is 21 h. 8m., his declination is 16° 40′ south, and his diameter is 7·2″.

Mercury rises on the 1st about half past 5 o'clock in the morning; on the 31st he rises about twenty-four minutes after 5 o'clock.

MARS

is morning star, but is at present of the least account of all the brotherhood. His near approach to Mercury on the 17th has already been recorded.

The right ascension of Mars is 21 h. 33 m., his declination is 15° 40′, his diameter is 4·4″, and his place is in Capricornus.

Mars rises on the 1st a few minutes before 6 o'clock in the morning; on the 31st he rises a few minutes before 5 o'clock.

VENUS

is morning star. Though still beautiful to behold, she has fallen from her highest estate, for her bright face grows dim; her stay in the morning sky decreases in time as she travels on her westward way, retracing her steps toward the sun and increasing her distance from the earth. She, as well as Mercury, pays her respects to Delta Capricorni, passing the star on the 26th about three degrees north. Thus Venus, Mercury, and Mars are all in Capricornus during some part of the month, near each other and near the sun.

The right ascension of Venus is 19 h. 48 m., her declination is 19° north, and her diameter is 21·6″.

Venus rises on the 1st at seventeen minutes after 4 o'clock in the morning; on the 31st she rises at ten minutes after 4 o'clock.

JUPITER

is evening star, and plays the same brilliant part he has played for several months as leader of the resplendent host of heaven. Although traveling from us, his luster scarcely shows any perceptible diminution, and, until he sinks below the horizon, the eye singles him out at a glance from his twinkling companions.

On the 13th, at 9 o'clock in the morning, he reaches quadrature. Hanging in superb equipoise half way between opposition and conjunction, rising at noon-day, reaching the meridian at 6 o'clock, and setting at midnight, he has reached a position where he appears to almost as good advantage as when he takes on his most imposing aspect at opposition.

Jupiter never fails to excite profound interest, whether we follow his course with the naked eye or through the telescope. The telescopic view just now is full of excitement. The Prince of Planets has met with a loss. The "great red spot," 26,000 miles long, and 6,000 or 8,000 miles broad, has almost entirely vanished. The extraordinary phenomenon that has been eagerly and assiduously watched since its appearance in 1878 has nearly disappeared, and zealous observers are little the wiser for the study bestowed upon it. Various opinions prevail concerning its origin and constitution. Some astronomers think it was an enormous rift in the planet's cloud-atmosphere, revealing the nucleus beneath. Others think that it was a slag or crust formed on the semi-fluid surface of the planet, revolving with it, and now melting down and disappearing. Others think it was a kind of cloud of smoke coming from a long-continued volcanic eruption on the planet underneath. Doubtless new spots will succeed, and some time in the distant future astronomers will decipher their meaning. But the time is not yet.

The right ascension of Jupiter is 5 h. 24 m., his declination is 23° 2′ north, and his diameter is 38·8″.

Jupiters sets on the 1st a quarter after 2 o'clock in the morning; on the 31st, he sets at half past 12 o'clock.

SATURN

is evening star, ranking second on the list in size and brightness. There is nothing specially noteworthy in his course during the month, as he slowly makes his way toward the sun. Observers will notice the comparative shortness of his stay above the horizon, as he sets now a half hour before midnight.

The right ascension of Saturn is 3 h. 15 m., his declination is 16° north, and his diameter is 16·6″.

Saturn sets on the 1st at half past 11 o'clock in the evening; at the end of the month he sets a few minutes before 10 o'clock.

NEPTUNE

is evening star, and continues to take precedence in the time of setting. The distance between Neptune and Saturn is slowly increasing, Neptune making his transit seventeen minutes before Saturn.

The right ascension of Neptune is 2 h. 57 m., and his declination is 15° 3′ north.

Neptune sets on the 1st a quarter after 11 o'clock in the evening; on the 31st he sets at twenty-one minutes past 9 o'clock.

THE MOON.

The March moon fulls on the 23d at twenty minutes past 1 o'clock in the evening. She is the most distinguished moon of the year, and exerts an untold influence upon the affairs of men; for the first full moon after the vernal equinox determines the time on which Easter shall fall. Easter in turn determines the time of the other movable fasts and feasts of the church. This year the moon fulls three days after the vernal equinox, and the following Sunday, the 25th, marks the Easter festival, within three days of the earliest date on which Easter can occur. The moon therefore decides that the Lenten season shall commence early this year.

The moon pays her respects to the planets in the following order: The waning moon is near Venus on the 5th, and near Mercury and Mars on the 7th. The new moon of the 8th is in conjunction with Neptune on the 12th, Saturn on the 13th, Jupiter on the 15th, and Uranus on the 22d. None of the conjunctions are near enough to be of special interest. Our neighbor, the moon, presents five phases during the month, being seen in the last quarter on the 2d and on the 31st.

RESHARPENING FILES.

The old method of giving files a second life was by recutting. So far as this was confined to files with sufficient body to sustain the second assault, it may have proved to be economical. But there are many files used which are necessarily thin and not capable of being reduced from their thinness.

To recut a file, the file must be ground down to the "plate," the smooth surface below the "roots" of the teeth. All the teeth must be ground out, and the space below the "roots" of the teeth also, if good afterwork is expected. And then it is only the thick files with fine cuts that are of any value for recutting purposes. With a coarse file, as a bastard, or a mill file, the blows of the cutter's hammer have disturbed the relations of particles in the slab of steel so seriously that they have almost disintegrated the steel before the hardening process had made the incipient cut of the chisel noticeable to sight or subject to fracture. So it does not always "pay" to anneal, grind, and recut a worn-out file.

But the useful life of the file may be perceptibly and economically prolonged by proper care. Sometimes the teeth of new files are broken off before performing useful work by "bearing on" to a file and attempting to rasp through the foundry skin of an iron casting. Sometimes new files are clogged with soft metals. In either case the trouble has been done before the file has had its chance. The newly-cut teeth of the file should be protected from abuse. The file tooth is similar to the razor edge, and has a fringe of self-supporting fibers requiring the gentlest treatment at the first. After this "wire-edge" is worn off—not roughly broken off—the file teeth are ready for their daily duty. To perform this they should be kept clean. It is not alone the finishing files, used with oil as a lubricant, which get foul with a gurry of oil and file dust; but there are dry-used files which have lodged between their teeth slices of wrought iron, splinters of steel, and crumbles of composition, of brass, of bronze, or of babbitt. To remove these obstructions is one of the duties of a filer, and the proper methods for this removal ought to be a part of every filer's education or a lesson in his instruction.

For cleaning a greasy finish file there is nothing better than a burning over the forge fire, in the flame of an alcohol lamp, or of a gas blaze. The burning should be done by a gentle passage to and fro through the flame, until the grease on the file burns with a blaze. Then the blaze should be blown out and the file be carded. When cleaned, dip the file into a jar of lye, and clean in pure water.

For removal of clogged particles a chisel of flattened wire is as good as anything. This is used by hand, and its mechanical effect is simply to drive out the lodged particles by a ploughing process.

For resharpening of file teeth acids have been employed, and to a certain and limited extent they are valuable. For this process the file must be chemically clean. This is insured by a soluble alkali, as lye, or an immersion in benzine, or naphtha, or spirits of turpentine, then a bath in clean warm water. The cleansed file may be placed point down in a jar of acid made up of half nitric acid, half sulphuric acid, and the combined amount of water—that is, as much water as the quantity of the two acids. The file, resting toe down, may remain in this solution an hour or more, according to the depth of the teeth. But a much simpler method is to wash the cleansed file with the pickle at the foundry, and when it dries off wash it again, repeating the process several times, and finally washing off with clear water or with lye water and clear water.

It is doubtful, however, that this acid method ever really sharpens the teeth of the file. It cleans the file chemically, and allows it to do its work better than when the file is clogged and dirty. The only real resharpening of files is of a mechanical character, and that is a contrivance that shoots sand and water or emery and water against the file teeth, at their back, with the force of a boiler pressure of steam of from 60 lb. to 80 lb. per square inch. In this contrivance, which has been in successful use for many months in some of our large establishments, from a tank holding quartz, sand, and water the mixture is drawn up through flexible tubes and directed simultaneously against the upper and lower surfaces of the file by the force of the steam. The steam acts in this case exactly as it acts when employed as an injector of water into boilers—the steam force lifts the diluted sand bath and directs it, with its boiler force, against the teeth of the file as the file is passed back and forth through the converging fires of the two tubes.

The result is a great improvement in the useful life of worn-out files.

Estimates of Lighting Brooklyn Bridge.

At the February meeting of the trustees of Brooklyn Bridge, Engineer Martin reported bids for furnishing electric lights for the bridge as follows: Arnoux-Hochausen Electric Company, $15,750; United States Illuminating Company, $18,150; Schuyler Electric Light Company, $20,000; Edison Electric Light Company, $21,500; Brush-Swan Electric Light Company, $23,273; and the Fuller Electric Company, $25,455. The bids were for supplying seventy lights, the proposal to include engines, dynamos, conductors, lamps, lamp posts, and everything, except the steam, necessary to make a complete plant.

Preference was expressed for the acceptance of the second bid, owing to the circumstance that the lowest bidder had had less experience in circuit lighting. The question was referred to a committee. The cost of the bridge to date has been $14,345,686.72.

Rubber Lubricator for Belts.

Five parts of India-rubber are cut fine and melted together with five parts oil of turpentine in an iron well-covered vessel; then add four parts of resin, stir well, melt, and add four parts of yellow wax, stirring constantly while melting. This mixture while warm is added, with constant stirring, to a melted mixture of fifteen parts fish oil and five parts of tallow, and the whole is agitated until it has congealed. The mass is applied to old belts upon both sides in a warm place, and when the belts are in use, from time to time upon the inner side. By this treatment they become very durable.—*Chem. Centralblatt.*

IMPROVED WINDMILL.

In the windmill shown in the accompanying engraving, the wheel converts the power of the wind into available power and requires no vane to keep it properly faced toward the wind. The construction of the wheel is peculiar and well calculated for constant use.

The wings, of iron, are secured at their outer ends to a wide iron hoop, and the shaft to which the wheel is attached is supported in an inclined position by two conical rollers, which are placed on opposite sides of the spherical bearing, which keeps the shaft in place. The conical rollers bear on opposite sides of an annular plate, supported by the enlarged upper end of the vertical shaft of the mill.

As the wheel is revolved by the pressure of the wind, the conical rollers impart motion to the vertical shaft, by rolling on the annular plate, and the wheel will automatically face itself to the wind, whatever its direction.

The motion of the upper part of the vertical shaft is communicated to the lower portion through a friction clutch, operated by a centrifugal arrangement something like a centrifugal ball governor. The levers to which the balls are attached are carried by the upper part of the shaft, and press the sides of a cone on the upper end of the lower portion of the shaft. When the action of the wheel is normal, the levers of the regulating apparatus press the cone, and the lower portion of the shaft is driven with the same speed as the upper portion; but when the speed of the wheel increases, the balls rise by centrifugal force, and the lower portion of the shaft is released, while the upper part of the mill may revolve at any rate of speed without endangering it or the machinery below.

The centrifugal apparatus is provided with means by which it may be made to preserve the connection between the two parts of the shaft, when the speed of the wheel is above the normal.

This mill is very simple in its construction, and may be built and kept in order at a comparatively small expense. Further information in regard to it may be obtained by addressing the inventor, Mr. David A. Smith, of Greencastle, Pa.

A Home-made Telephone.

The *American Farmer* gives the following directions for making a cheap home-made telephone:

To make a good and serviceable telephone, good from one farm house to another, only requires enough wire and two cigar boxes. First select your boxes, and make a hole about a half an inch in diameter in the center of the bottom of each, and then place one in each of the houses you wish to connect; then get five pounds of common iron stove pipe wire, make a loop in one end and put it through the hole in your cigar box and fasten it with a nail; then draw it tight to the other box, supporting it when necessary with a stout cord. You can easily run your line into the house by boring a hole through the glass. Support your boxes with slats nailed across the window, and your telephone is complete. The writer has one that is 200 yards long and cost forty-five cents that will carry music when the organ is played thirty feet away in another room.

Callaud's Sulphate of Copper Battery.

L'Electrician says: In this battery, made by Messrs. Dumoulin and Froment, the sulphate of copper is placed in a glass jar, in the bottom of which there are two holes. By this arrangement the sulphate of copper can easily be removed, and the liquid be more or less stirred up, without bringing the solution in immediate contact with the zinc. The piercing of the two holes can be easily done, and at very little cost.

The positive pole is formed by a copper wire, rolled in the shape of a spiral at its lower end, and consequently is without weld, solder, or any possible break in its continuity. A protection of rubber, sufficiently thick, formed by a simple tube slipped over the end of the copper wire, covers it from the bottom to outside the outer jar. The zinc is suspended by two hooks, which are simply passed through two holes made in the top of the jar, and which rest on the edge of the outer jar.

This battery has one peculiarity which can be of a certain use as regards attending to it—namely, the difference generally noticed between the level of the liquid inside and outside of the glass jar. If the battery is in good condition, the liquid in the jar is lower than that with the zinc, thus showing that the solution of sulphate of copper is concentrated, or nearly so, and that of zinc sulphate is not so; this case proves the battery to be in good working condition. If, on the contrary, the heights of the liquids are equal, or even if the sulphate of copper should be higher than the other, it is because the copper solution is not concentrated enough, or that the sulphate of zinc solution is overcharged with salt.

The constants of the battery thus made do not differ at all from those of the ordinary callaud (E=about 1 volt, R= 6 to 8 ohms), because the positive pole is always kept in the solution of sulphate of copper, which escapes from the jar through the two holes.

Mitchell's Atlas of the World.

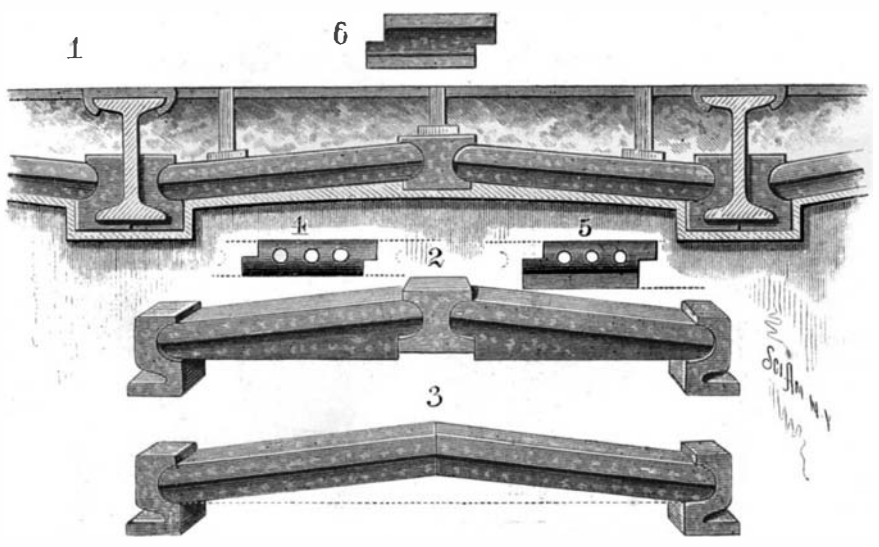
This is a well known standard book, large quarto pages, containing maps of the various countries of the world, in all 147 maps and plans, embracing, especially, most excellent maps of the United States. The maps are printed from copper plates, and the nomenclature is clear and good, the whole finished and colored in admirable style. Plans of the principal cities are also given; together with valuable tables, showing population, post offices, etc. This book forms one of the most useful and convenient works for general reference, and should have a place in every business establishment and in every household. Mr. P. O. Smith is the general agent for the work, headquarters at the Cosmopolitan Hotel, New York.

SMITH'S IMPROVED WINDMILL.

FIREPROOF FLOOR AND CEILING.

We give an engraving of one of the latest and best forms of filling for fireproof structures, which consists of buttresses planted against the beams resting on the lower flanges and extending partly across the lower edge of the beam, and struts which with a central or key piece form a toggle arch between the beams. The engraving shows three forms of this filling.

In Fig. 1 the struts are flat, with rounded ends fitting in corresponding bearings in the buttresses and in the key piece. The device shown in Fig. 2 is nearly the same, the only difference being the horizontal face on the under surface of the arch. Fig. 3 shows an arch in which the key is dispensed with, the struts abutting in the middle. Fig. 4 is an end view of the strut shown in Fig. 1; and Fig. 5 shows the inner end of the strut shown in Fig. 2. Fig. 6 is a side view of the key piece.



NEW FIREPROOF FLOOR AND CEILING.

The floor is laid on strips placed on the struts or buttress blocks and key, and the spaces between its strips and above the struts are filled with concrete. The under face of the arch is finished in any desirable way. The great advantage of this system is that the arch can be placed without the use of scaffold or stages of any kind, thus greatly cheapening the construction. A pair of buttresses and a pair of struts with the key are placed, then other buttresses are placed on the beams, and another pair of struts placed in position with their ends resting on the buttress and on the rebate and key projecting from the first pair of struts, the buttresses being arranged to break joints with the struts. Another pair of buttresses is now inserted, then another pair of struts placed, and so on. This filling adjusts itself automatically to its bearings, and is strong and well calculated to perfectly insulate one floor from the effects of heat in another. To make the filling as light as possible without impairing its strength, it is apertured lengthwise.

This device is the invention of Mr. Andrew J. Campbell, of 552 to 558 W. 33d St., New York city.

Water Rights Maintained.

In a suit recently brought in Rhode Island by one manufacturing company to restrain another manufacturing company located on a stream above the first, to prevent the polluting of the stream with dyestuffs, chemicals, etc. The court granted an injunction.

Judge Potter, in the opinion, said: "Every owner of land has the right to have the water which passes his land come to it in its pure, natural state. The offending company here contends that while this might be very good law in former days for an agricultural people who used the water for washing, drinking, and watering animals, there has been a complete change of circumstances; that we are largely interested in manufactures; and the wealth of the State depends mainly on their prosperity, and that the more valuable use should prevail. The right of the riparian owner, farmer, or mill owner, to have the water pass his land in its natural state and to a use of it to any extent which shall not injure it for the use of others, is as much his property as the land itself. This court cannot alter the law, neither can the Legislature itself take the right away any more than it can take its land. If needed for the public use, the State can take this right on making compensation, but it cannot be taken from one man and given to another even if he pays for it; that must be left to private agreement."

Water Supply for Cities and Towns.

At a recent meeting of the American Society of Civil Engineers, in this city, the supply of water for cities and towns, from subterranean sources, or ground water, as developed in the United States since 1870, was described by Mr. J. J. R. Croes, C.E. It was at first supposed that such supply could be obtained by filtration of river or lake water through the gravel of its banks. It was discovered, however, that in fact much more water came from the land side than from the river, and that wherever such a source of supply is successful, the water really comes from the underground reservoirs or streams which are found generally in all valleys containing much gravel.

The wells, galleries, and basins constructed in various places were described, and their success or failure indicated. It was stated that experience was generally against the construction of open galleries or canals, on account of the vegetable growth which always occurred in such cases.

Screw in Tunnel.

The Lightning, one of the earliest torpedo boats supplied by Messrs. Thorneycroft to the British service, has been lately subjected to a series of progressive speed trials at Portsmouth, under the superintendence of Chief Engineer Castle, of the Steam Reserve. The steering power of the craft, which is otherwise satisfactory, has always proved defective in consequence of the wide circle which she required to turn in. In order to surmount the difficulty the propeller has recently been incased in a tunnel; but while it was thought that the device might improve her handiness in going round, it was feared that might detract from her speed. Trials were accordingly ordered to be made upon the measured mile in Stokes Bay, for purposes of comparison with the speed which she realized with the original propeller. Four runs was made at full speed, 14 knots, 12 knots, and 10 knots. When tested to the utmost a mean speed of 16·5 knots was obtained, or about half a knot less than under the old conditions. The horse power developed, however, was also less, and as this is supposed to be due partly to the inferior character of the coal used, and partly to the fuel being forced over the bridge and so choking some of the boiler tubes, it is probable that further runs will be ordered. The steering in circling and going ahead was better than before, but in steering with the engine going astern the results were less satisfactory than with an open screw.

IN France in 1881 there were more than a million residents of foreign birth, chiefly Belgians, Germans, Swiss, and Italians. England, with 27,000,000, has only 140,000 foreigners; Germany, with 45,000,000, only 270,000; while France, with 37,400,000, has 1,000,000.

The Paper Dummy Patent Invalid.

Fifteen years ago the Patent Office granted a patent to Brock for dress dummies made of papier mache, intended to take the place of the wire frames used for exhibiting dresses, clothing, etc. The improved dummies being smooth, made the dresses and clothes look better. This has proved to be a most valuable patent; the owners were making lots of money out of it, and did not relish the idea of having anybody interfere with their rights. So they brought suit against several infringing parties, and the case was decided not long ago by Judge Wallace, in the United States Circuit Court, adversely to the patent. He holds that the patent is invalid, because paper dummies were used in making up wax figures prior to the grant of the patent. Inasmuch as the wire dummies did not contain the paper or papier mache shell, and the lay figures did not contain head piece, shaft braces, or base of the patented device, they were not anticipations of it. The proofs show that the patented dummy has commended itself to the public interested in such devices. It is a better model of the human figure, and because of the continuous surface of the shell clothing can be made to fit more accurately upon it than upon the interstitial frame or shell of the wire dummy; but the patent cannot be sustained because the device is destitute of patentable novelty. If the substitution of the paper or papier mache for the wire of the shell or frame was obviously practicable, the patentee was not an inventor. If mechanics skilled in the particular department of construction could have seen at a glance the feasibility of the change, then, although the device may have been mechanically new, it was not intellectually novel. The paper which was substituted for the wire had been used to make the shell of a figure in imitation of the human body, and the figures in which it was thus used had been employed for displaying clothing. The displaying of clothing was not the primary purpose for which these lay figures were intended; but that use was not only suggested, but was very obviously one of the ends in view. Not only, therefore, had the material that the patentee substituted for the wire been employed, as he employed it, to make the shell or frame of a figure resembling the human body, but it had also been applied to perform the same office. The new application of an old material to a cognate use will not generally support a patent, but here it was employed in the same use. The bill in the several cases was dismissed.

Large Freight Steamer.

The new freight steamer City of Fall River, of the Fall River Line, which made her first trip recently, is the largest freight steamer in the country. Her capacity equals the combined capacity of the Bristol and the Providence. It is asserted that in her design and build, in propelling power, and other essential features she is a new departure in steamboat building. Her hull, built at Chelsea, Mass., is of oak and hackmatack, with oak plankings, clamps, and stringers. Her dimensions are 273 feet over all, 42 feet 4 inches beam, 17 feet of hold, and she registers 2,533 gross tons. She has three watertight bulkheads. Her machinery was constructed at the North River Iron Works. The engine is a compound vertical beam engine, with surface condenser. The two cylinders, 68 inches and 44 inches in diameter, are so arranged that either can be used alone. The boilers are of steel, one-half inch thick, with a tested pressure of 150 pounds per square inch, although her working pressure is intended to be but 80 pounds.

She has feathering paddle wheels, invented about fifty years ago, but not generally used except in Southern waters. They are 25 feet 6 inches in diameter, and there are twelve paddles to each wheel. Her speed on her trial trip was 17·3 knots per hour and her average speed in all kinds of weather, it is claimed, will be not less than 15·9 knots an hour. The estimated cost of the steamer is $250,000. She is commanded by Captain Thomas Collins.

THE Cincinnati *Price Current* estimates that a year ago a barrel of pork was equal in value to 2⅞ barrels of family flour, while at present prices it is the equivalent of 3⅝ barrels. That is, pork is now twenty-five per cent higher, as compared with flour, than a year ago. When meat is high and bread low, more bread and less meat will be eaten. At a very low estimate the increase in flour consumption in this country alone, thus produced, is equivalent to over ten million bushels for the current year.

IMPROVEMENT IN CUTTER HEADS.

We give engravings of several forms of improved cutters and cutter heads, used in matching, moulding, and other wood working machines. These heads possess many advantages over the old fashioned heads having movable bits, among which are, the facility with which they may be adjusted, and the certainty of always having them accurately in position, the uniformity of the work done by them, and their freedom from the danger of the cutters flying from the machine.

These heads within five years have found their way into almost every mill in the country, upon their own merits. The cutters in the tongue are arranged in two series, viz., upper and lower cutters, which cut alternately, each pair completing a full cut across the edge of the lumber—producing either tongue or groove. A second peculiarity, and one of great importance, is that of slanting the cutters, by securing them to seats alternately arranged and alternately inclined, thus giving the clearance at the side, so that no part of the cutter comes in contact with the lumber but the cutting edge; this insures light and easy running.

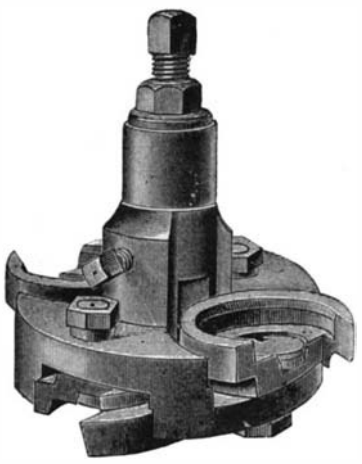


Fig. 1.—TONGUE HEAD

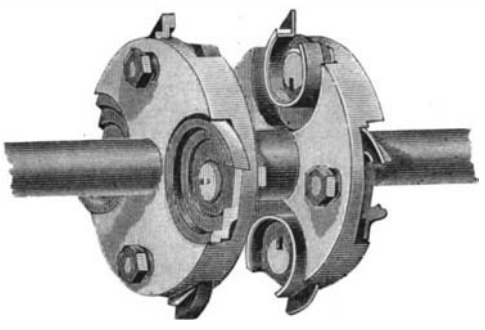


Fig. 2.—HEADS FOR BOX BOARD MATCHING.

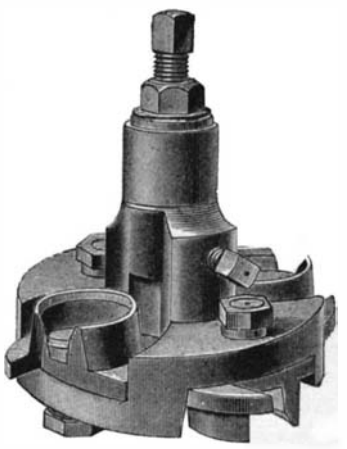


Fig. 3.—GROOVE HEAD.

Fig. 4 shows the position of one of the cutters and side clearance when in the cut, and the outline of the cutter that is to follow and complete the full pattern. The engraving shows the latest improvements in the placement of two of the cutters below and two above the flange, thus adapting the heads to any expansion or change of tongue and groove.

The amount of service one set of these cutters will render is very great, the outer circle measuring from 4½ to 7 inches, all of which is tool cutting edge, and being fastened upon their centers, are, as they wear away, brought around until the entire circle is used up.

The cutter is held by bolt and nut, which when drawn up cannot move the cutter, as the parts in contact therewith are stationary, the bolt being slotted to fit a key in the head. The cutters thus fastened are secured to their seats on their large, flat sides, and work through the hardest knots and at the fastest feed without moving. The knife edges of the cutters are slanted to produce a draw cut, and will not chip up or break out knots. The chip started at the tongue is cut outward, while the groove cutters start the chip at the outer edge of the board and cut inward, leaving the corners full and free from checks, the points of the cutters working the offset having the lead, thus producing a tongue and groove of a uniform size and shape that will always fit.

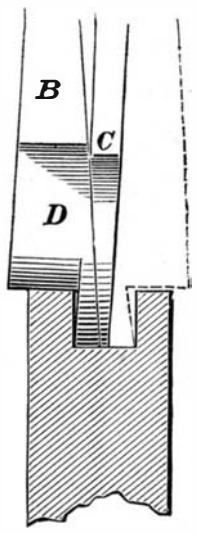


Fig 4

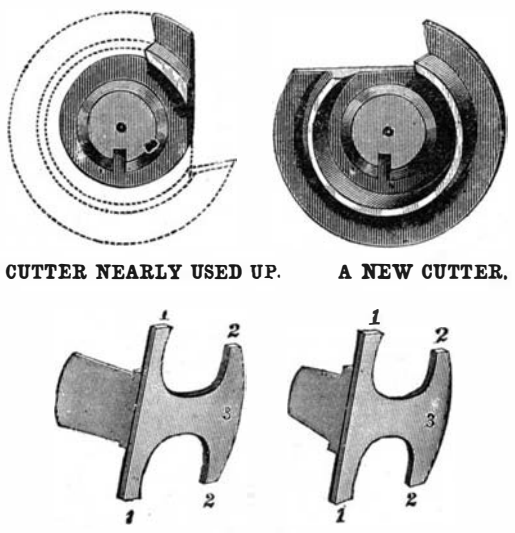


Fig. 5.

GAUGE FOR TONGUE HEAD. GAUGE FOR GROOVE HEAD.

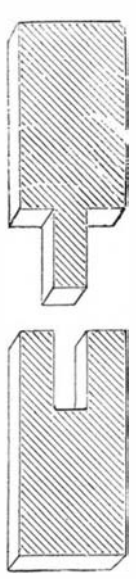


Fig. 6.

Each head is furnished with a gauge (Fig. 5) for setting the cutters, carefully fitted to their slanted edges, showing the angle at which to file them; keep the cutters fitted thereto, and the head will remain full size. The arms, 1, 1, fit over the round part of the nut that holds the bit. The arms, 2, 2, will pass down by the side of the head, and the point, 3, will rest on the outer circle of the head. With the gauge in this position, the face of bit must fit up against the face of gauge.

Fig. 2 represents a set of matching heads, applied to mandrels for matching box boards. They make a neat, clean joint, as shown in Fig. 6. These heads are made in a variety of other forms for moulding, for sash, for ship laps, jointing, and so on. Further particulars in regard to this useful invention may be obtained by addressing Messrs. Shimer & Company, Milton, Pa.

Flint Lock Guns.

One of the most important of Birmingham industries is the gun trade. A very large number of shot guns go to America from here every year. Many fine fowling pieces are included, but still most of the guns are of a very cheap kind. A strange branch of the gun business here, says Consul King, is the manufacture of guns for the east and west coasts of Africa. These weapons are still made in great numbers, and usually have very long bright barrels and old fashioned flint locks. It seems that the natives of the African coasts and interior prefer flint to percussion locks, because of the difficulty of procuring caps. The guns for this trade are very cheap, some selling as low as five or six shillings apiece at wholesale; but every barrel has to be tested at the government proof house, the same as if intended for the finest of hammerless breech-loaders.

Panic.

The *Lancet* says it is not much use asserting that assemblies of sane persons ought not to become victims of panic, but, in truth, unless the nervous system of man could be reconstructed on a principle which would necessarily deprive it of some of its most excellent qualities, it is impossible that there will not always be a tendency to impart and receive this impression, which so powerfully affects the mind and body that judgment is for the time suspended, and the limbs either refuse to act or act impulsively or under the control of the emotional part of the being. Discipline is the only remedy for a tendency to panic. What is needed to cure the tendency to panics in assemblies is the discipline of crowds.

Inventors and Inventions.

Invention is, in every instance, says Mr. Edward Gibbon Swann in a recent address in London, the result of two things: first, of the sagacity which has discerned a *want;* secondly, of the resolute effort to *supply that want,* whether it be to obviate or overcome an existing difficulty or to furnish a totally new condition to certain phases of life or of industry. "*Necessity* is the mother of invention," in the broad sense of the axiom. It is *not,* in all instances, so as regards individual examples. It has frequently happened that important inventions have been brought about by what we might call the *hobbies of leisure.* Nevertheless, there is always a far greater probability (and consequently a greater frequency of occurrence) that a naturally ingenious person with a practical insight into certain particular applications of skill—but goaded by the need and perhaps the sufferings of his surroundings and himself—finds his only solace in the elaboration of an idea, and that that idea finds expression in the solution of some problem, whether scientific or purely mechanical, or both. In fact, he blossoms into an inventor, and yields seed in an invention.

General Wolseley on Alcohol.

Replying to a deputation of the Blackburn Temperance Mission at the residence of Major-General Fielden on the 18th instant, he said that he had always employed the opportunities afforded him to impress the necessity of temperance on those under his command. In the Red River expedition, against the advice even of the medical men who accompanied the troops, he decided that no spirituous liquors should be taken with the force; and yet no men ever did harder work or behaved better than those on that expedition. In South Africa his personal body guard consisted almost exclusively of temperance men; and there too the doctors, who had predicted all manner of ills from the absence of grog, had absolutely nothing to do. In Egypt, again, the doctors told him that it was very necessary the men should have grog, and he was obliged, owing to the great pressure put on him, to allow it occasionally; but it was given in very small quantities and rarely, and yet the troops in Egypt were admirable in their behavior. He had long held that drink was the great source of crime, disobedience, and other evils in the army.

SILK production is said to be in the following proportions: Italy, 37 per cent; China, 36; France, 8; East India (Bengal), 7; Japan, 6; Spain, 2; Persia and the Levant, 4.

Plagues and Pestilences.

At a recent meeting of the members of the Statistical Society, London, Mr. Cornelius Walford read a paper on the "Chronology of Plagues and Pestilences, as Affecting Human, Animal, and Vegetable Life." The facts collected by Mr. Walford are interesting, as showing the superstition of the people in all ages of the world's history.

The view that plagues and pestilences are judgments dated from the earliest Pagan times, and students of the classics will remember the plague supposed to have been caused in Attica by the gods as a punishment for the slaughter of a sacred bear; that in Thessaly by Apollo on account of disrespect shown; a plague at Sicyon caused by Apollo and Artemis for the same reason; and the plague in Samaria given in Josephus as the punishment of idolatry. In the Iliad, Homer describes the plague which prostrated the Greek camp from the wrath of Apollo at an insult offered to Chryses, his high priest. A similar plague was inflicted by Apollo at Corina, on account of Hyppolatus killing his prophet. Delphi, we are told, suffered a plague and famine as punishment for the ill treatment of Æsop. In Rome a dreadful plague raged, which the sibylline books proved to have been caused by the incontinence of a vestal virgin, who strangled herself to avoid being buried alive.

Scripture records recount five instances of plagues inflicted by God as direct punishment for discontent and murmurings among His chosen people. Coming to profane history, we learn, A.D. 665, over-population caused a dearth of food in Ireland, which prepared the people for a severe infliction of plague, which had broken out in England the year before. Rufini tells us that the joy of the English at the victory of Cressy, in 1347, and the surrender of Calais the year after, induced such unbridled excess and debauchery that God, not permitting these disorders to go long unpunished, inflicted the plague, which, after traversing Asia and Europe, raged with such fury in London that 50,000 persons were buried in the churchyard of the Charterhouse alone. The belief in these direct judgments remained down to very modern times.

That earthquakes are the more potent of the terrestrial causes of plagues and pestilences had the support of Scripture authority, notably in the fourteenth chapter of Zechariah and the seventeenth of St. Luke, verse 2. Thucydides mentions a plague, associated with serious earthquakes, preventing the annual invasion of Attica, and the famous Black Death of 1348 was preceded by fearful earthquakes and fiery meteors of portentous aspect. A violent earthquake in Central Germany heralded the third appearance of the sweating sickness and epidemic encephalitis, in 1517, and of that epidemic in Holland at the same time, which physicians now believe to have been diphtheria. The great eruption of Mount Hecla, in 1783, when a river of lava twelve miles wide flowed in six weeks a distance of sixty miles into the sea, drying up twelve rivers and destroying twenty-one villages, was followed by diseases of a most peculiar and inveterate kind.

In the same year there were most destructive earthquakes in Italy and Messina, and terrible pestilences prevailed in Central Europe, due, as is supposed, mainly to the vapors or exhalations. Great destruction of life has been attributed at different times to mephitic vapors not due to earthquakes. In the year 140 B.C., the Roman army in Algeria are said to have fallen victims to mephitic vapors generated by themselves for the destruction of the inhabitants, and in A.D. 168 a plague at Rome, preceded by a still more destructive plague in Asia, was supposed to have had its origin in foul airs from a small box which a Roman soldier had opened at the capture of Seleucia.

Our own annals tell of a marvelous visitation of rain and thunder in 1223, by which the congregation of the church of Barnwell, near Cambridge, were sorely tried. "Such flashes of lightning entered the church that each man thought it had been set on fire; and such a filthie stench arose withal that manie of the company fell sick thereof and hardly escaped death." The plague of 1345–49, which is said to have begun in China, "from the vapors proceeding from a certain fiery body which fell from the atmosphere, or was eructated from the earth," caused awful mortality. In Florence, 100,000 people died; in London, 59,000 are said to have died in a single week; while 100,000 perished in Venice, 90,000 in Lubeck, and 200,000 in Spain.

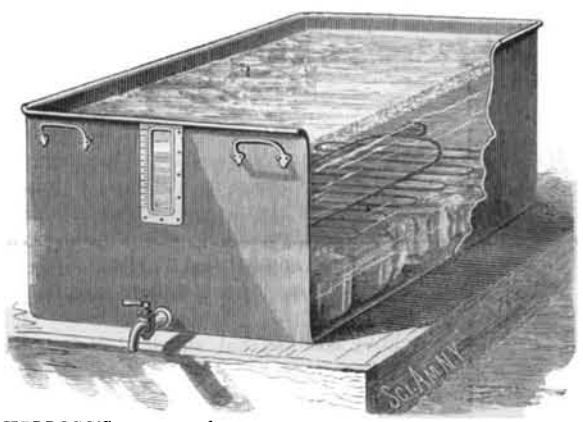
One of the modern theories ascribes pestilence to cosmic dust composed of iron, nickel, cobalt, and other substances. This receives some support from the Jewish writer Philo, who, in A.D. 92, describes a "loimic" pestilence arising from clouds of dust, which produced severe and intractable ulceration of the skin, both of men and animals In A.D. 593, during a pestilence in Rome, the air was charged with a mist or cosmic dust which induced violent sneezing, which gave rise to the expression "*Dominus tecum*" to a sneezer, a practice not yet extinct. A haze or "dry fog" has been frequently noted as accompanying cholera visitations. Such a haze, which was of a pale blue shade, and possessed of peculiar drying properties, and of a marked and indescribable odor, was very prevalent in the year of convulsions just a century ago, and its dispersion in 1783 was attended with violent thunderstorms. It is thought that this haze may be associated with the powerful agents which seem to pervade the air after volcanic and earthquake eruptions, and on scientific grounds it seems clear that some diseases may be so occasioned.

During plagues and pestilences popular superstition has frequently suggested poisoning the waters as the cause. Different sects were thus led to accuse each other, and this and other malpractices, and the mortality arising from disease was swelled by slaughter. At Mentz 12,000 Jews fell victims to the populace on suspicion of having poisoned the wells of the city. In Milan, in 1630, when a severe visitation of plague occurred, there was a popular belief that the disease was propagated by people who anointed the walls of the houses with a poison fatal to all who touched it, and many unfortunates who were suspected lost their lives; while the house of a barber named Mora, who was accused of preparing the poison, was pulled down, and a column, known as the "Column of Infamy," was erected on the site, where it remained until 1778.

Drought, both in ancient and modern times, has been too intimately connected with diseases of unusual severity to leave much doubt of their being in some way connected. Pestilence has been caused not unfrequently by the decaying bodies of locusts and animals perishing during an epizootic visitation, as well as by decaying vegetable substances. Under all the other heads some very curious and interesting facts were collected and stated, and a complete enumeration was given of all the authenticated cases of plagues that have afflicted humanity, and of the legislative means taken for mitigating their effect; the author suggesting, at the conclusion of his paper, that there still remained to be treated the "Periodicity of Plague Visitations," the "Spontaneous Origin of Disease," and "Pestilential Cyclones."—*English Mechanic*.

IMPROVED METHOD OF RAISING CREAM FROM MILK.

Milk is mainly composed of cream, caseine, sugar, some neutral salts, and water, as is well known. Caseine is coagulated by the application of heat. Cream is the oily or unctuous element, and, like all oleaginous matter, hardens on being cooled. Hence in dairying processes cheese is made by heating the milk, butter by cooling it. It is a well known fact that rapid cooling of milk hastens the formation and increases the quantity of the cream, and the fresher and sweeter the milk, and the quicker and more thoroughly the cream is "raised" or concreted from it, the better in



KELLOGG'S APPARATUS FOR RAISING CREAM FROM MILK.

quantity and quality will be the butter produced, and the more valuable will be the skimmed milk for cheese making or other use.

The engraving shows an apparatus for the rapid refrigeration of milk to facilitate the concretion of cream, and thus increase the quantity and quality from a given bulk of milk. In this apparatus ice is applied to milk in a convenient and effectual manner.

This is accomplished by filling the vat to about one-fourth its depth with clean, pure ice, in as large cakes or pieces and as compactly placed as may be. This bulk of ice will give the requisite proportion of ice to milk—that is, about ten pounds of ice to forty pounds of milk—when the vat or vessel is filled up. The specific gravity of ice being less than that of milk, it will naturally float, and so mingle with and impede the rising and formation of the cream on the surface. For this reason the ice is confined by bars or grating to the bottom of the vat or vessel before filling with milk. The cream, being quickly and thoroughly extracted, rises and forms evenly on the surface, leaving a fresh and sweet residuum of "skim milk."

The cream may be removed in about forty minutes after the setting, and the skim-milk then drawn from the vat, when no material part of the ice will have melted, and the water from the melting ice neither mingles with the cream at all, nor with the skim-mik in quantity to perceptibly affect its value for any purpose.

It is claimed that this process greatly increases the yield of butter, and it permits of taking the milk to the dairy before it becomes sour, and the milk will yield the same amount of cream as though fresh drawn from the cow. The process is said to work equally well in all climates.

This invention has been patented by Mr. Henry W. Kellogg, of Ripon, Wis.

The Power of Homœopathy.

At the recent meeting of the Medical Society of the State of New York, a spicy discussion took place concerning that section of the code of ethics, adopted last year by the American Medical Association, which allows allopathic or ortbodox physicians to hold consultations with homœopathic doctors. There seemed at one time to be a strong disposition on the part of some members of the State Society to secede from the American Association, unless the latter will repeal or expunge the objectionable rule. It would seem from the proceedings of these learned medicals that homœopathy, mild and harmless as it is upon ordinary sick people in general, has a most extraordinary effect upon the cerebral organs of certain New York doctors. We give a few disconnected abstracts from the speeches:

Dr. H. R. Hopkins of Buffalo, said: To maintain that one may refuse to consult with another because he does not like him is absurd. The practice under the old code may be fairly expressed by putting it in this way: "That no consultation shall be held with regularly licensed physicians who hold eclectic or homœopathic views." The people have created this society, and also eclectic and homœopathic societies. When this society assumes that its members may not meet regularly licensed physicians in consultation, it makes itself ridiculous.

Dr. H. D. Didama, of Syracuse: A consultation is a fraud, where no good can possibly come to the patient, when physicians consent to consult with persons who differ from them as light does from darkness. Those gentlemen who support the new code, will they tell me how any possible good can come to the patient by consulting with a man who believes that an ordinary dose—five grains of quinine—should be diluted in twenty-eight hogsheads of water, of which solution one drop should be given as a dose? Dr. Roosa knows that the homœopath would not give a dose containing any appreciable quantity of medicine. We claim that we give something, and they give practically nothing.

Dr. Thomas F. Rochester, of Buffalo: I rise with the full consciousness of the importance of this question. The American Association has been called a junketing association, a Rip Van Winkle association. What is this word "progress"? It is a good deal like the Irishman's definition of a retrograde movement—"an advance backward." What are we to gain by the first clause of this new code? It says we may go into consultation with homœopaths or others. Thus we have started down from our plane to meet them; they don't come up to meet us. What do we expect when we do go to them? We meet, we talk, we don't agree in therapeutics or diagnosis, but the people are satisfied. We cannot do this without degrading ourselves, and I cannot see any possible advantage to result. We cannot reform homœopathy. It is impossible for anything of this kind to take place.

Dr. C. R. Agnew, of New York: This is a very serious moment in the history of this society. These gentlemen, amiable as they may be, are endeavoring to lead this society not only to the edge of an abyss, but down into an abyss. Adopt the resolutions, repeal the present code and re-enact the old one, and you put this society in opposition to the policy of the State, and you attempt to coerce the members of this society into an attitude in which no person who is capable of construing the laws will agree with them.

Dr. Hutchison: I am ready to step into the abyss, and consider it the proudest moment of my life. I desire to read a petition which has been circulated in the city of New York, and which I have been requested to present here. The petition has only been circulated for a short time, or there would have been more names on it, but it contains already one hundred and two names; among them are the names of such men as Alonzo Clark, Austin Flint, and others of like character. The petition opposes the new code. I desire also to read a letter from Dr. Sayre. (The letter was explanatory of the circumstances of the consultation with the homœopath.)

Dr. William P. Seymour, of Troy: I think it a damning shame that a specialist should be the only man to stand up here and defend the practice of ages. It seems as if no one could get the floor here unless he was in favor of the new code. I have a telegram here from Dr. Lewis Sayre. I do not mean to mince matters. I agree with the statement that we are on the verge of an abyss, but I believe that, if anybody goes into it, it will be those who flaunt the flag of philanthropy. They have talked law till I am sick. They have talked law as if we were made for law. Good God! the laws were made for us.

The telegram from Dr. Sayre being called for, he read a dispatch stating that Dr. Sayre was confined to his bed; also a dispatch from Dr. Sayre to the effect that he had met in consultation a Dr. Baldwin, but there was nothing to indicate that Dr. Baldwin was a homœopath, and he did not know he was one till afterward.

After further talk in the same general style, the discussion of the innocent globule of homœopathic milk sugar contained in the code was postponed for one year.

A Remarkable Vein of Natural Gas.

For several months drilling has been in progress for natural gas at Hills Station, on the West Pennsylvania Road, some nineteen miles distant from Pittsburg, Pa., on the line of Allegheny River. A plate glass manufactory is under construction at that point, under the management of J. B. Ford, formerly of the New Albany Works at Indiana. Between $2,000,000 and $3,000,000 will be invested in the plant. February 13, when the drillers had reached a depth of 1,170 feet, a remarkable vein of gas was struck. The vapor immediately ignited, burning down the shanty and derrick. The drillers barely escaped with their lives. The strike caused great excitement, and the parties interested in the works are delighted, as it will, they think, make them independent with respect to fuel for melting and annealing purposes.

Correspondence.

A Storm of Snow Balls.

To the Editor of the Scientific American:

On the morning of February 21, the snow here presented a novel and striking appearance. During the previous night about two inches of light snow had fallen while there was a fresh southwesterly breeze, which afterward changed to northwest, and the morning was beautifully clear.

The surface of the snow, where the land was not very uneven or much inclined, was strewn with snowballs, varying in size from about nine inches through down to very small ones. Some were nearly spherical in general form, but nearly all were merely rolls of snow, funnel-shaped at the ends. These rolls, at the circumference, measured about the same (or a little less) in length as in diameter. There were many over nine inches through and myriads of small ones. The surface of the snow was marked with shallow furrows as the snowballs were formed, showing the changing direction of the wind. The balls were of sufficient consistency to be handled carefully.

J. M. MERROW.

Merrow Station, Conn., Feb. 21, 1883.

The Chemistry of Cookery.

BY W. MATTIEU WILLIAMS.

The Boiling of Water.—As this is one of the most rudimentary of the operations of cookery, and the most frequently performed, it naturally takes a first place in treating the subject.

Water is boiled in the kitchen for two distinct purposes: first, for the cooking of itself; second, for the cooking of other things. A dissertation on the difference between raw water and cooked water may appear pedantic, but, as I shall presently show, it is considerable, very practical, and important.

The best way to study any physical subject is to examine it experimentally, but this is not always possible with every-day means. In this case, however, there is no difficulty.

Take a thin* glass vessel, such as a flask, or better, one of the "beakers," or thin tumbler-shaped vessels, so largely used in chemical laboratories; partially fill it with ordinary household water, and then place it over the flame of a spirit lamp, or Bunsen's or other smokeless gas burner. Carefully watch the result, and the following will be observed: First of all little bubbles will be formed, adhering to the sides of the glass, but ultimately rising to the surface, and there becoming dissipated by diffusion in the air.

This is not boiling, as may be proved by trying the temperature with the finger. What, then, is it?

It is the yielding back of the atmospheric gases which the water has dissolved or condensed within itself. These bubbles have been collected, and by analysis proved to consist of oxygen, nitrogen, and carbonic acid, obtained from the air; but in the water they exist by no means in the same proportions as originally in the air, nor in constant proportions in different samples of water. I need not here go into the quantitative details of these proportions, nor the reasons of their variation, though they are very interesting subjects.

Proceeding with our investigation, we shall find that the bubbles continue to form and rise until the water becomes too hot for the finger to bear immersion. At about this stage something else begins to occur. Much larger bubbles, or rather blisters, are now formed on the bottom of the vessel, immediately over the flame, and they continually collapse into apparent nothingness. Even at this stage a thermometer immersed in the water will show that the boiling point is not reached. As the temperature rises, these blisters rise higher and higher, become more and more nearly spherical, finally quite so, then detach themselves and rise toward the surface; but the first that make this venture perish in the attempt—they gradually collapse as they rise, and vanish before reaching the surface. The thermometer now shows that the boiling point is nearly reached, but not quite. Presently the bubbles rise completely to the surface and break there. Now the water is boiling, and the thermometer stands at 212° Fahr, or 100° Cent.

With the aid of suitable apparatus, it can be shown that the atmospheric gases above named continue to be given off along with the steam for a considerable time after the boiling has commenced; the complete removal of their last traces being a very difficult, if not an impossible, physical problem.

After a moderate period of boiling, however, we may practically regard the water as free from these gases. In this condition I venture to call it cooked water. Our experiment so far indicates one of the differences between cooked and raw water. The cooked water has been deprived of the atmospheric gases that the raw water contained. By cooling some of the cooked water and tasting it, the difference of flavor is very perceptible; by no means improved, though it is quite possible to acquire a preference for this flat, tasteless fluid.

If a fish be placed in such cooked water, it swims for a while with its mouth at the surface of the water, for just there is a film that is reacquiring its charge of oxygen, etc., by absorbing it from the air; but this film is so thin and so poorly charged, that after a short struggle the fish dies for lack of oxygen in its blood, drowned as truly and completely as a living, breathing animal when immersed in any kind of water.

Spring water and river water that have passed through or over considerable distances in calcareous districts suffer another change in boiling. The origin and nature of this change may be shown by another experiment as follows: Buy a pennyworth of lime water from a druggist and procure a small glass tube of about quill size, or the stem of a fresh tobacco pipe may be used. Half fill a small wine glass with the lime water, and blow through it by means of the tube or tobacco pipe. Presently it will become turbid. Continue the blowing, and the turbidity will increase up to a certain degree of milkiness; go on blowing with "commendable perseverance," and an inversion of effect will follow; the turbidity diminishes, and at last the water becomes clear again.

The chemistry of this is simple enough. From the lungs a mixture of nitrogen, oxygen, and carbonic acid is exhaled. The carbonic acid combines with the soluble lime and forms a carbonate of lime which is insoluble in mere water. But this carbonate of lime is to a certain extent soluble in water saturated with carbonic acid, and such saturation is effected by the continuation of blowing.

Now take some of the lime water that has been thus treated, place it in a clean glass flask, and boil it. After a short time the flask will be found incrusted with a thin film of something. This is the carbonate of lime, which has been thrown down again by the action of boiling in drawing off its solvent, the carbonic acid. This crust will effervesce if a little acid is added to it.

In this manner our tea-kettles, engine boilers, etc., become incrusted when fed with calcareous waters, and most waters are calcareous; those supplied to London, which is surrounded by chalk, are largely so. Thus the boiling or cooking of such water effects a removal of its mineral impurities more or less completely. Other waters contain such mineral matter as salts of sodium and potassium. These are not removable by mere boiling.

Usually we have no very strong motive for removing either these or the dissolved carbonate of lime, or the atmospheric gases from water, but there is another class of impurities of serious importance. These are the organic matters dissolved in all water that has run over land covered with vegetable growth, or, more especially, which has received contributions from sewers or any other form of house drainage. Such water supplies nutriment to those microscopic abominations, the *micrococci, bacilli, bacteria,* etc., which are now shown to be connected with blood poisoning—possibly do the whole of the poisoning business. These little pests are harmless and probably nutritious when cooked, but in their raw and wriggling state are horribly prolific in the blood of people who are in certain states of what is called "receptivity." They (the bacteria, etc.) appear to be poisoned or somehow killed off by the digestive secretions of the blood of some people and nourished luxuriantly in the blood of others. As nobody can be quite sure to which class he belongs, or may presently belong, or whether the water supplied to his household is free from blood poisoning organisms, cooked water is a safer beverage than raw water.

The requirement for this simple operation of cooking increases with the density of our population, which on reaching a certain degree renders the pollution of all water obtained from the ordinary sources almost inevitable.

Reflecting on this subject, I have been struck with a curious fact that has hitherto escaped notice, viz., that in the country which over all others combines a very large population with a very small allowance of cleanliness, the ordinary drink of the people is boiled water flavored by an infusion of leaves. These people—the Chinese—seem, in fact, to have been the inventors of boiled water beverages. Judging from travelers' accounts of the state of the rivers, rivulets, and general drainage and irrigation arrangements of China, its population could scarcely have reached its present density if Chinamen were drinkers of raw instead of cooked water.—*Knowledge.*

* In applying heat to glass vessels, thickness is a source of weakness or liability to fracture, on account of the unequal expansion of the two sides, due to inequality of temperature, which, of course, increases with the thickness of the glass. Besides this, the thickness increases the leverage of the breaking strain.

Eclipses of the Sun.

Recently Professor Langley lectured in the Lowell Institute course, Boston, upon the corona as seen in total eclipses of the sun. He remarked that the very brightness of the sun prevents us from seeing many things that are going on near to its surface. All lesser lights, which, if seen, would fascinate us with their strange beauty, are extinguished in its presence. Day after day the sun shrouds from us the stars, and but for its withdrawal below our horizon we should not know of their existence. The illuminations of the moon and that of the aurora borealis and the zodiacal light in like manner are dissipated by the sunlight. The light of that outer rim of the sun, which is called the chromosphere, is in the same way usually hidden from us. Nor can any device of man so screen and subdue the light of the sun that that of the chromosphere will become visible. Only in the presence of a total eclipse are these phenomena, which are more wonderful and beautiful than any other of the celestial spaces, to be seen. The duration of visibility then is but two or three minutes. While total eclipses of the sun are not infrequent, but few persons, comparatively, have seen one. The explanation is that the space over or along which a total eclipse is visible is not of more than eighty or one hundred miles width. That which was visible in this country in 1878, passed diagonally across the territory of North America. The shadow entered in Alaska and passed through Texas and across the Gulf of Mexico in two or three hours' time, being visible, at totality, not more than three or four minutes at any point.

The passage over the earth of the swiftest moving objects with which we are familiar, the most rapid express trains, is at a rate of about sixty miles an hour. This shadow moves along at thirty miles in a minute. The form which this shadow assumes in space is that of an extremely elongated cone, the base of which corresponds to the diameter of the moon, and the length to the distance between the earth and the moon. Our conception of it must be somewhat different from that which is ordinarily suggested by the word "cone." It is to be imagined rather as having the relative proportions of the finest cambric needle, the point of which barely touches the earth. The vision of this dark shadow, as it approaches from the distant horizon, is the most imposing phenomenon in nature. More terror would doubtless be inspired by an earthquake, but the sense of awe would be greater in an eclipse. The impression thus produced is felt by all men, and is shared by the more intelligent of the lower animals. A scientist once tried a curious experiment on a dog in this way: Among other preparations for the eclipse, he confined the dog several days beforehand, giving him nothing to eat. Just as the shadow began to come on, he threw down before the dog an appetizing bone, but the animal would not touch it for the space of five minutes or more, or until the darkness had wholly ceased and the sun shone brightly again. When the American observers had made their preparations in Shelbyville, Ky., for the eclipse of 1869, negroes living in the vicinity gathered around to witness the show which they had learned was to come off, but the nature of which they did not understand. Surmising it might be something like a circus, they, by a false analogy, thought it would be well to take positions in the branches of some of the neighboring trees. When the appalling shadow came down upon the scene, their fright was excessive, and its effect was described as being audibly like that of the continuous falling of ripe fruit from the trees. They scampered for the safe inclosure of their several homes.

In every company of men, whatever may have been the foregoing hilarity, silence and a feeling akin to terror overcome the gazers as the dark shadow comes down like a material thing moving with swiftness inconceivable over hill and valley from the horizon. A strange light precedes it, which is partly of a greenish tint but wholly unlike any other. The lecturer described the moments of suspense during which men of science await their opportunity as the shadow approaches, which they know will continue but two or three minutes and for which they have spent days and perhaps months of preparation, and which, in most cases, they have traveled hundreds or thousands of miles to witness and record. The feeling must be similar, he said, to that experienced by one who for the first time goes into battle or enters upon any undertaking of great peril. There is an extraordinary tension of the mental faculties, which makes cool observation almost impossible, and it proves that ten or twelve observers viewing the phenomenon from the same point will have as many different descriptions to give of it. Their penciled sketches of what they saw do not agree. The photographic lens, which has no nerves, does better, but it, for reasons which the lecturer explained, fails adequately to represent the wonderful sight. The Boston *Advertiser* says: The illuminated screen was freely employed for more definite explanation by the lecturer, who, with his photographic assistant, Mr. Black, had contrived a representation of the bursting forth of the light of the corona from behind the dark face of the moon, which was very realistic and which evoked generous applause.

The New Salt Field of New York.

A press dispatch from Warsaw, N. Y., dated February 13, states that the representative of a syndicate of English capitalists had selected that new salt field as a site for large works for the manufacture of caustic soda, to be used in soap making, bleaching, dyeing, and other purposes. For this commodity this country now relies solely upon Europe, one company in New York selling $4,000,000 worth the past year. Investigation of the brine underlying Warsaw proved it to be of the exact strength and the salt of the desired purity for manufacturing this article.

Land has been purchased at Warsaw, and the expectation is that the English company will soon begin the erection of extensive soda works, to give employment to perhaps 1,000 men, and to have a capacity to decompose 100,000 tons of salt a week.

Experienced salt manufacturers assert that the Warsaw district is certain to become the future salt field of the United States. A general salt fever seems to pervade western New York. In all towns of any size stock companies are being formed to investigate. Pifford, on the Rochester, New York, and Philadelphia; Castile, on the Erie; and Pike, on the Rochester and Pittsburg, will sink wells. In Wyoming and Greggsville salt has already been found. Leroy has two wells which produce brine of varying strength. Warsaw seems to have all the natural advantages desirable, and experienced men locate their wells here after very short examination. Prospectors, contractors, derrick builders, speculators, and capitalists are coming to town daily from all over the United States.

UPRIGHT DRILL PRESS USED AS A BORING LATHE.

The engraving shows a simple method of converting a vertical drill press into a boring lathe, which will be readily understood without description. A boring bar inserted in the drill spindle is guided in a bearing in the bed plate and carries the boring tool. This simple device for boring is employed on work of considerable size in the shops of the Boston and Albany Railroad.

The Ice Trade of New York.

During the midwinter ice season, nearly 10,000 men were employed in cutting and securing the ice of the Hudson River. Fully 2,500,000 tons have been cut and stored. The ice is described as of splendid quality, clear and solid, and it is believed will keep well. The ice fields from which New York dealers draw their stock extend from Rockland Lake, 253 miles up the Hudson, to Albany, embracing both sides of the river. Over $5,000,000 is invested in the business. The largest operator in this city, if not in the country, is the Knickerbocker Ice Company, owning about fifty ice houses.

At Rockland Lake, which has a surface of 383 acres, there are three with a capacity of 150,000 tons. At Lake Meagh, in Westchester County, which has a surface of 100 acres, the company has one house with a capacity of 50,000 tons; at Marlboro, below Poughkeepsie, there is another, and from that point to Albany they are scattered along both sides of the river. This year the company began work on January 8, and finished February 6. During that time 8,000 men, on an average, were employed, and 1,500,000 tons were cut and stored. The cost of this work was about $250,000. All of the houses are full to the roof. The company carried over from last year's stock enough for this winter's use.

Next to the Knickerbocker ranks the Mutual Benefit Company, which has harvested over 100,000 tons. This company has three ice houses—one at West Park, holding 50,000 tons, one at Staatsburg holding 20,000 tons, and one at Barrytown, in Dutchess County, holding 40,000 tons. It has employed about 600 men.

The Consumers' Ice Company has employed about 500 men, and has stored not more than 100,000 tons in its two houses at Catskill. The New York Company has two houses in Greene County, one at Catskill and one at Athens. From 500 to 600 men were employed, storing 100,000 tons. Other companies are the National, which has stored 80,000 tons, and the Glasgow, which has stored not more than 50,000 tons. Private purchasers are estimated to have stored 160,000 tons, and smaller ice companies enough to make an aggregate of between 2,000,000 and 2,500,000 tons.

UNDERGROUND ELECTRIC WIRES.

The practicability of laying underground electric wires has been determined, and the absolute necessity of removing the electric wires from poles on the streets and buildings is apparent, especially in our cities. The suspended cable system is deficient in many respects. To the practical thinking electrician, there is but one solution of the problem; the wires must be laid underground, and the question now is as to the best way of doing it. A noted enterprise of this kind is now being carried out between Marseilles and Paris, the distance being 536 miles. In this case the cable is inclosed in a cast iron pipe laid at the depth of about 5 feet; the pipe sections being protected at their joints by India-rubber washers and lead rings. Chambers or well holes are made in the ground about 1,500 feet apart, into which the cable is passed, and at which the wires may be inspected and connected to branch systems. Besides these well holes, there are manholes about 300 feet apart. The whole expense of this work is estimated at about eight million dollars.

A similar experiment in a small way is now being tried in Boston, where wrought iron tubes about 2 inches in internal diameter are used, and so far as the device has been tested, very satisfactory results have been obtained. The object now seems to be, simply to ascertain the best method of laying underground wires.

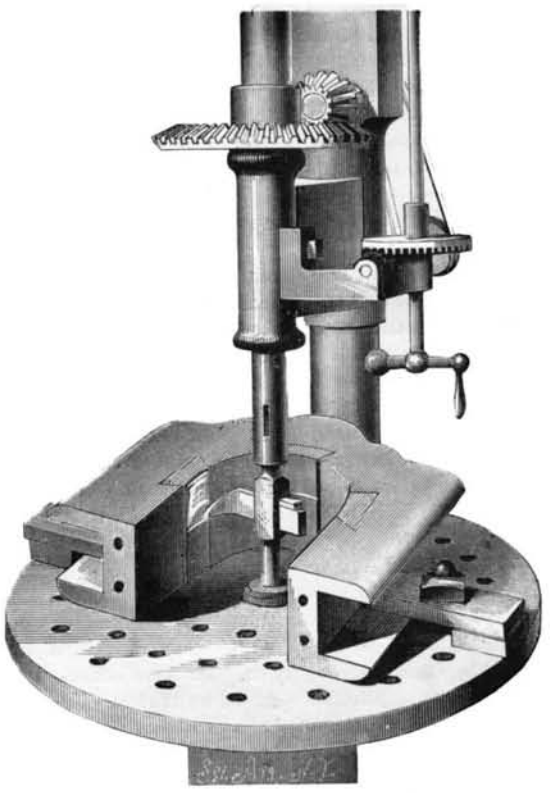
One of the objections to the pipes now in use for underground wires is, that the cable inserted from any manhole must be bent almost at right angles, in order to get it into the pipes. Again, these pipes being horizontal, accumulate water, which sooner or later will have a bad effect upon the cable. So far as experiment has demonstrated, the system of pipe laying invented by Mr. P. J. Duggan, of Boston, is complete and practicable, as it admits of perfect drainage along its whole length, allows the cable to be drawn in after the pipe has been laid, admits of inspection, and its intersection and connection points are always conveniently accessible.

The importance and utility of Mr. Duggan's invention will be manifest when it is thoroughly understood.

A strong casing or frame surrounds the manhole, and a cover fits into it and protects the cover of the manhole. The section of the pipe which is nearest the surface of the ground has an elliptical manhole for inserting and withdrawing its cables and for inspection.

The sections of the pipe are jointed together in any suitable manner, and are inclined, as shown, so that as they approach the central section, between the two manholes, they are deeper in the ground. The middle section is deepest of all, and has its center portion provided with a drainage or pump pipe.

The drainage pipe, when used as a pump pipe, is brought



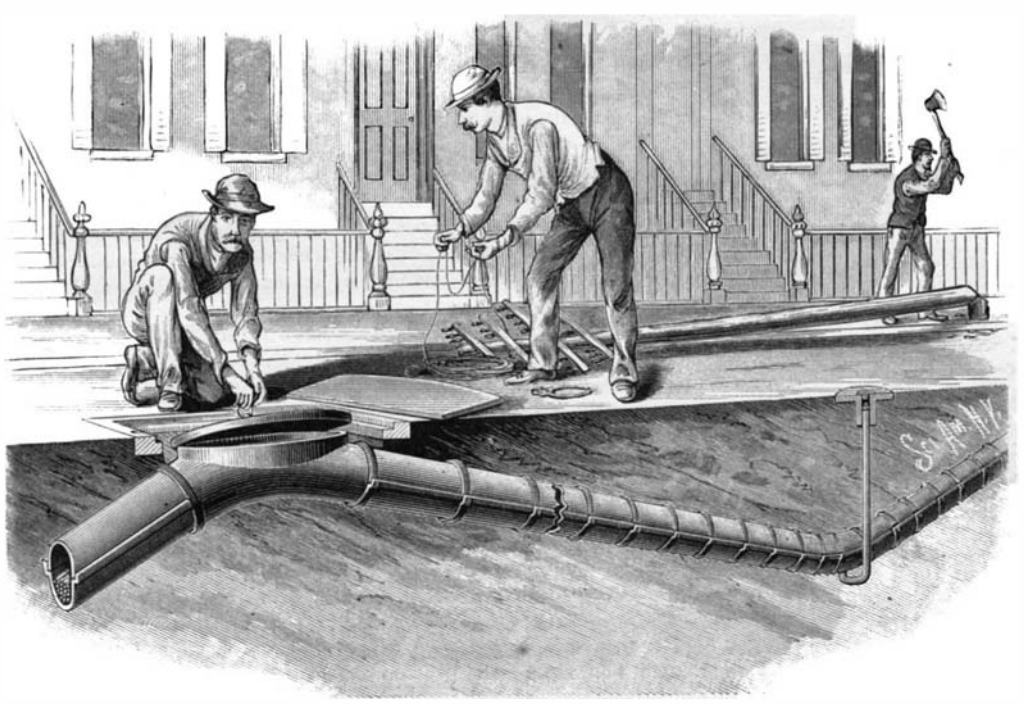
UPRIGHT DRILL PRESS USED AS A BORING LATHE.

to the surface, where a portable pump may be attached. In laying long wires or cables, each section of pipe should be divided longitudinally.

In laying the pipes, a trench is dug and properly graded, then the lower halves of the pipe are laid, after which the conducting wires are carefully placed in position, and, in addition to these conducting wires, one or more cords or wires are laid, which extend from one manhole to a distance equal to twice the space between the manholes. These supplemental wires or cords are used for drawing in new wires, but are not used as conductors.

When the conducting wires and supplemental wires or cords are properly placed, the upper halves of the sections of pipe are laid and the trench filled.

In using these devices for short circuits, the pipes may be



DUGGAN'S SYSTEM OF UNDERGROUND ELECTRIC WIRE.

whole and the wires drawn through from manhole to manhole, the circuits being completed by connections made at each manhole. This system has many advantages which should insure its general use.

Further information in regard to this invention may be obtained by addressing the New England Organ Company, 1,299 Washington Street, Boston, Mass.

THE ballet at the Princess's Theater, Manchester, in which there are twenty-six ladies, has now been for the past month lit up with the small Swan lamp. Each lady carries a lamp in a small flower placed on her head, and at her side a small battery, the average weight of which is one and a half pounds.

Colorado Coal.

The coal deposits of Colorado are practically inexhaustible, and they are to be found in almost every portion of that State. The Denver *Republican*, in a recent issue, gives some interesting statistics concerning them. The northern belt—in three counties—some twenty mines, is now being worked, the coal from which is free-burning, semi-bituminous, and of fair quality, the output for last year having amounted to 550,000 tons. The middle region—that lying between Denver and Colorado Springs—from the only mine being worked the output during the last half of the year was some 34,000 tons; while in the southern belt, which includes Trinidad and El Moro, the entire region is rich in fine quality of coking coal. At the Starkville Mine 100,000 tons were mined and shipped last year, the value of which loaded on the cars was about $2 per ton. At the same point forty coke ovens are in operation, the product of which is worth $4.50 per ton, and all of which goes to Arizona. The Eagle Mine shipped 400,000 tons of coal and 12,000 tons of coke, and another mine produced 20,000 tons of coal. The output of coal from the Cañon region was 160,000 tons for the year; while that from the Gunnison country was 43,500 tons of soft and 2,000 tons of anthracite coal. The Colorado Coal and Iron Company manufactured at their mines at Crested Butte 10,000 tons of coke.

The area of soft coal land outside of Crested Butte is very extensive, coal of more or less degree of excellence being found under hundreds of square miles throughout Gunnison County. The anthracite coal is found over an extensive territory, but much of it is inaccessible and of an inferior quality. The best coal is found at the head of Anthracite Creek, about three miles from Crested Butte. An equally good quality is also found on Rock Creek; but the immense seams found down Anthracite Creek toward the North Fork of the Gunnison River hardly come up to the Pennsylvania standard of excellence. The anthracite trade of this region is yet in its infancy, but when preparations that are now being made for mining and handling it are once fairly under way, it will probably be able to furnish 200 or 300 tons per day, and the demand will inevitably increase. The coal is in all respects the equal of the Pennsylvania anthracite, chemical analysis and physical structure failing to show any material difference.

La Plata County is also very rich in excellent coal, the largest vein of which is the Mammoth, near Durango, which is 52 feet in width. In this county the seams are numerous and large, and for the most part so situated as to allow of cheap and expeditious mining. The character of the coal is mainly bituminous and well adapted to cooking, though some of the seams yield a steam coal of remarkably good quality. The output in 1882 from the various mines there was about 5,900 tons, to which should be added the output of the railroad mine at Monero, which is in this belt, which produced 12,000 tons, making a total of 17,900 tons for the county for the year. At Como, in Park County, 75,000 tons of coal and 96,000 tons of coke were sent to market.

In summing up, the *Republican* says: Coal was produced in other sections of the State of which no returns could be secured, but it is believed that 100,000 tons will cover it all. The output was, in other words, nearly 2,000,000 tons, valued at about $4,000,000 at the mines. The anthracite output, nearly 2,000 tons, value about $10,000, and the coke production reached the sum of nearly 100,000 tons, valued at $4.50 at least, a total of at least $450,000, making the value of entire coal output $4,460,000.

Ornamenting Glass.

J. B. Miller contributes to *Neuste Erfindung* a description of a rapid and practical method of printing designs or labels on glass. The ink employed consists of 90 parts of French oil of turpentine, 30 parts of Burgundy pitch, 10 parts of pulverized Syrian asphalt, and 2 parts of pulverized mastic. These are boiled together and form a pasty varnish, which is spread out on a plate of ground glass, from which it is transferred to the rubber type by means of a rubber roller. The ink must not be put on too thick. The glass is printed with this ink, and then dusted over with finely pulverized Syrian asphalt and heated in a sheet iron muffle until the ink and asphalt unite to form a brilliant varnish. If the glass is to be deeply etched, the dusting with asphalt must be repeated.

If the whole glass is not to be rendered matte, the remainder is covered, with the exception of a round or oval vignette, with a mixture of 1 part stearine and 2 or 3 parts tallow. It is then put in lye, and the part that is to be etched is well washed with water, when the glass is put in dilute hydrofluoric acid for five minutes, rinsed with water, and put in the "matte bath," where it is left fifteen or twenty minutes. It is afterward cleansed with hot lye and polished.

AN elm near Lawrenceburg, Tenn., is 105 ft. in diameter from tip to tip of its branches, and 329 ft. in circumference.

IMPROVED CAR TRUCK.

The engraving shows a railway car truck of novel construction, which may be used upon rails without ties, or upon any temporary railway having sharp curves in either a vertical or horizontal plane, such as may be laid upon an uneven surface without grading.

This invention is intended principally for transporting saw logs and other timbers to mills or shipping points, in which case temporary railway tracks are laid without grading. It may also be profitably employed by contractors and others requiring means for the transportation of quantities of material.

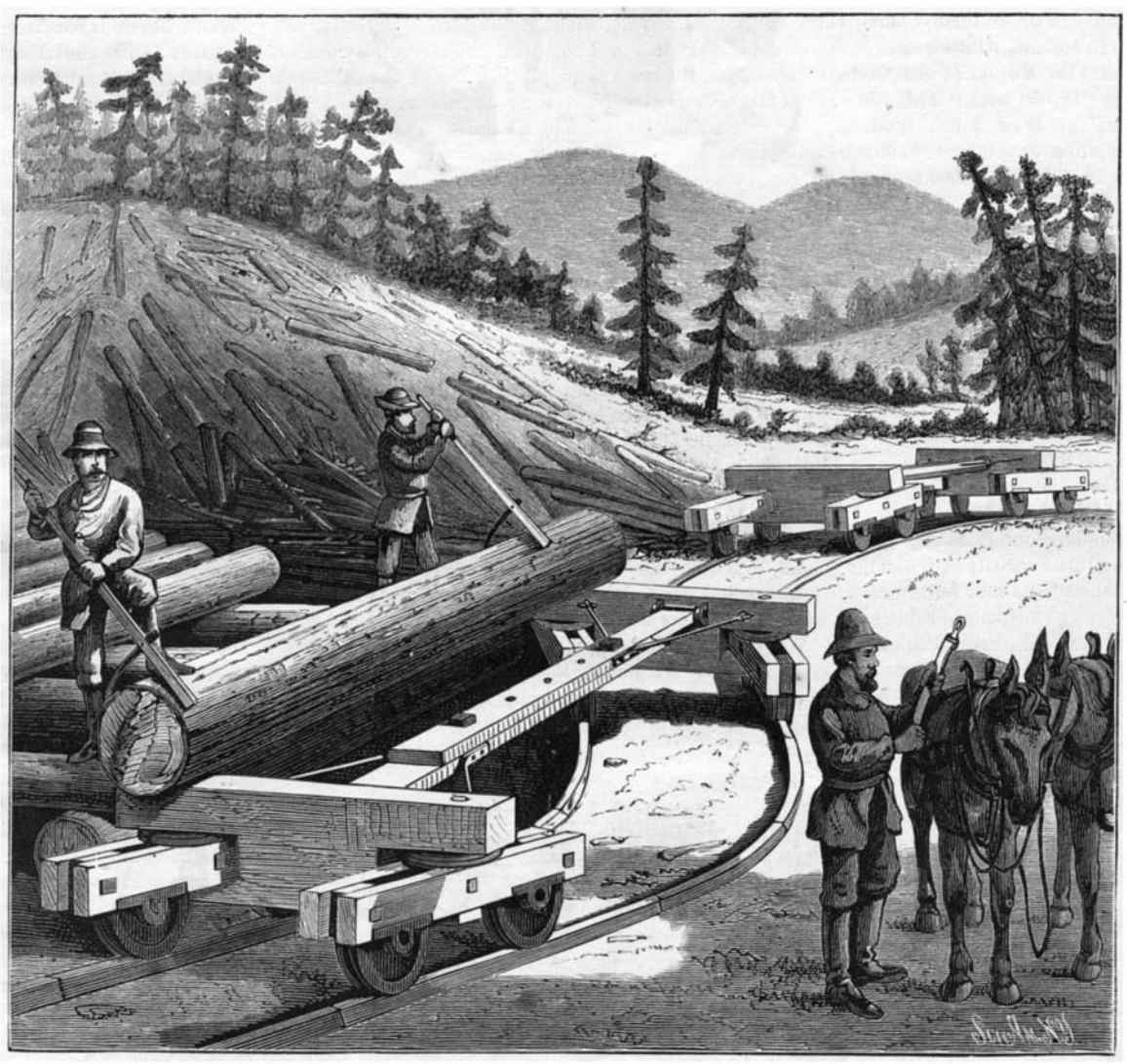
Where a track is laid on uneven surface of ground it is of great importance that the car truck shall be so constructed as to adapt itself automatically not only to sharp curves in a vertical plane, but also to undulations in a horizontal plane, to prevent straining of the framework and running gear of the car truck, and to avoid waste in propelling power. To accomplish this a series of truck frames are employed, which are swiveled independently of each other to opposite sides of the running gear by means of bolts passing through the ends of the bolsters.

Each truck frame is provided with two wheels arranged one in front of the other, and the wheels are constructed with a double flange adapted to overlap the rail on both sides, so that two rails are thus braced without the use of cross-ties. The tread of the wheels is made slightly broader than the rails, so that the two wheels of each truck frame will safely keep the track when turning a sharp curve.

The advantage of a truck frame having two wheels over one having but a single wheel is obvious in a case where great strength is desired; but this class of truck frames have been more or less rigidly connected together in pairs, and when so connected an undue amount of friction is caused between the wheels and rails for want of sufficient flexibility. Where a temporary track is used, composed frequently of wooden rails without ties, it is evident that a great degree of friction would necessitate constant repairing; but with the use of independent two wheeled truck frames, the desired flexibility of movement and action is secured, so that wooden rails are found to answer the purpose satisfactorily.

Each of the bolsters is provided with a reach which is hinged thereto, so that it will oscillate vertically, and the reaches of two bolsters are made to overlap each other, and are secured together adjustably by means of a bolt passing through holes in both. These truck frames are allowed to accommodate themselves to undulations in the track without disturbing the position of the load, and it will be seen that this car truck is adapted for use under exceptional conditions, where almost any other car truck in use would be all but impracticable. While this car truck is primarily designed for use upon rudely constructed tracks for the purpose of transporting immense timbers out of forests and for similar uses, it is also adapted for ordinary railways, and in some respects it may be found to be better adapted for this use than other trucks in use.

Any further information in regard to this invention may be obtained by addressing the patentees, Messrs. Blackman Brothers, Snohomish, Washington Ter.



BLACKMAN BROTHERS' LUMBER CAR TRUCK.

Floods in the Ohio Valley.

It is but a little while since the charitable of this country were making liberal contributions for the relief of sufferers by the floods in Europe. Now the distress has fallen upon our own people. At this writing it is estimated that at least 40,000 people in Cincinnati alone, and as many more along the river, are homeless or imprisoned by turbulent floods; thousands of others are out of employment; the loss in property is incalculable; many lives have been lost; and the sickness and suffering incident to present exposure, and sure to follow from the unsanitary condition of the now flooded district when the water shall have receded, are quite appalling.

Widespread and persistent rains falling upon frozen ground and ground covered deep with melting snow have caused a rush of water to the lower river valleys, such as their inhabitants have never seen before. On February 15, the depth of water in the Ohio at Cincinnati was over sixty-six feet, sixteen feet above ordinary high water, and two feet above the highest point recorded in the hitherto unparalleled flood of February, 1832. A large part of the city, including the gas works, is submerged, and the same is true of Covington and Newport across the river, and, indeed, of most of the towns on both sides of the Ohio River and in the lower valleys of its tributaries.

Louisville, Kentucky, has suffered grievously, hundreds of buildings having been carried away, while for seven miles along its water front, and over large areas in the lower parts of the city, back from the river, the water is up to or above the second floors. Three thousand houses are reported as entirely deserted. Many other large towns and cities on both sides of the river are in great part under water, or, like Lawrenceburg, entirely flooded. Other cities are surrounded by water and practically cut off from communication except by telegraph and boats. The interruption of the railways is general, and very serious, since the victims of the floods, especially in the smaller places, are largely without food or fuel.

It may be weeks before the real extent of the disaster can be made clear, and years before its calamitous effects can be obliterated.

The immediate cause of the flood is obviously an unusual fall of rain over a large area at midwinter, when the ground is in no condition to retain it. That the flood should be so sudden and violent is largely attributed to the destruction of the forests about the head waters of the river. No doubt the general clearing of the country has had some influence in hastening the precipitation of the flood-waters upon the main drainage valleys, but the circumstance that the worst previous flood on record happened over fifty years ago, and before the lumberman had seriously begun his inroads upon the forests west of the Alleghanies, is enough to forbid the throwing of any large part of the blame—if there be any—upon him.

The essential question now is how to reach and relieve speedily and generously the unfortunate victims of the flood.

Method of Preparing Canvas for Photography.

Dr. Sturenburg, in the *Deutsche Photographen Zeitung*, gives the following as his method of photographing upon linen, etc., as a foundation for painting upon: Take the whites of several eggs and add one gramme of chloride of ammonium to each egg; then beat these together to a froth *without* the addition of water, and let the mixture settle, and store in bottles. To use it coat the linen or canvas with a thin film of it by means of a paint brush, and then equalize the surface. In order to make the albumen less brittle, a little glycerine may be added when preparing the linen. The linen or canvas is then dried and sensitized upon a 1:8 silver bath. The prepared surface is rapidly dried beside a stove, and then immediately printed upon. The linen must not be allowed to stand when in this condition, because it would then easily become brown.

When the linen is stretched a board is placed under it, and the negative is laid upon the prepared surface. The whole is then carried out into the daylight and *printed very dark*. The negative should not be too soft, but very clear and powerful. After printing, the whole is slightly toned and then fixed in a 1:5 solution of hyposulphite of soda and water. After being well washed, the picture is coated with a moderately strong solution of bromide of potassium, and then, after being pretty well washed, is perfectly dried. The foregoing is useful for painting upon in water colors. When strongly sized drawing paper is used as the foundation instead of linen, the albuminous coat may be dispensed with and water substituted, when it is better to float the paper upon the latter than to put on the coat with a brush.

Olive Oil in the Holy Land.

The following is an extract from an interesting article contributed to the *Zeitschrift* of the German Palestine Exploration Society by the Rev. F. A. Klein:

The finest plantations of olives are in the Nablus district, but nearly every village has its larger or smaller grove. There is no doubt that the olive tree is one of the most valuable products of the country, and that it could be made a still greater source of revenue than it is at present. It requires but little attention, and lives and yields fruit even when neglected. It only requires grafting and a little digging up and clearing out, and this done, it yields a plentiful crop in return for the small amount of pains bestowed upon it. The *fellaheen* say that the vine is a *sitt*—a delicate town lady who requires a great deal of care and attention. The fig, on the contrary, is a *fellaha*—a strong country woman who can flourish without such tender care; but the olive tree is a bold *bedawije*, who, in spite of neglect and hardship, remains a strong and useful Arab wife. The olives ripen toward the end of the summer; the trees are then beaten with long sticks, care being taken not to destroy the young leaves and shoots. The fruit is collected and spread out on the roofs or somewhere, and then put into heaps for a little while in order that it may slightly ferment; after which it is taken to the oil press, where it is crushed under a heavy millstone, and, packed in little straw baskets, is finally pressed.

The oil (*zayt*) runs into a little cemented cistern, from which it is drawn in leathern bottles or large earthenware jars for carrying away. The *fellah* uses it both for light and nourishment. If he has nothing better, he is content to eat some bread soaked in oil. It is also used a great deal in town cookery, but as a means of light it has been almost superseded by petroleum. Much inferior olive oil is used for making soap, and in some years a great deal of oil is exported to France and Italy. The *jift*, or refuse of the olives, is used for fuel, having great properties of heat.

Steel Water Pipes.

The Chameroy Company make pipes of steel plate for conveying water under high pressure. The steel plates are coated with lead on both sides by immersion or otherwise, then rolled to form, riveted, and soldered the whole length, and covered with pitch. The first cost of the steel is not much greater than that of iron, and the steel pipes possess considerable advantages over those of iron. The lead coating is superior on account of the fineness of grain in the steel; the resistance to tensile strain and internal pressure is fifty to sixty times, and the resistance to deformation longitudinally from thirty to forty times greater, while the superior elasticity of the steel plate permits of the pipes receiving tolerably hard knocks without being permanently deformed. For equal thickness the steel tubes stand twice the internal pressure of the iron, and being both light and strong, they are admirably adapted for laying down temporarily and taking up again.—*Iron.*

Influence of High Temperatures on Diastase.

It has been observed by F. Huppe that the diastase of malt is not affected by a temperature of a 100° C. (212° F.), provided the diastase itself be quite dry; in the presence of water, or even of slight traces of moisture, the diastase would be seriously affected at much lower temperatures than the above. The same investigator states that diastase is completely destroyed as a ferment at a temperature of from 160° to 170° C. (320° to 348° F.), even when quite dry. It is, therefore, important that no malt or raw grain should be submitted to a temperature of 100° C., until practically all the moisture has been expelled; and that under no circumstances ought malt or raw grain which is intended to retain any diastatic power be submitted to a temperature in excess of 100° C.

Two Thousand Electrical Inventions in One Year.

The Washington correspondent of the New York *Evening Post* reports the substance of a recent address by Mr. Edward M. Bentley, one of the examiners in the electricity division of the Patent Office. Speaking of the work of the electricity division and of the recent marvelous development of electrical inventions, Mr. Bentley said that about two thousand applications for patents in electricity were filed in 1882, of which about two-thirds were granted. To show how the subject had grown in importance within a very few years, he said that in 1877 electricity was a sub-class in a division. Now it is the largest division in the office and regarded as the most important.

This astonishing growth is due chiefly to two causes: first, the invention of the telephone; and second, the development of the magneto-electric machine. The telephone had opened, directly and indirectly, a wide field of invention. The minds of many persons throughout the country were turned to this class of inventions, and not only were improvements on the telephone itself attempted, but attention was given to a great many incidental appliances useful in its successful application.

The second great stimulus to invention was the development of the magneto-electric machine. For thirty years the world had been awaiting a cheap and convenient source of electricity. Immediately following the discoveries of Faraday and others, from 1830 to 1840, there was a widespread effort to make practical use of them, and special activity was manifested in the line of electric lighting. The arc light was put into practical form, and the foundations of incandescent lighting were laid. But no economic source of electricity was at hand, for the galvanic battery consumed too much zinc for profit. The principle of the magneto machine had, indeed, been long known, but it was left for an Italian, Pacinotti, in 1860, to perfect a machine wherein continuous and constant currents were generated. The idea literally lay on the shelf, however, until 1870, when Gramme reinvented practically the same machine, and pushed it into notice. He was speedily followed by the Siemens brothers, of Berlin, and by Mr. Brush and others in this country.

The magneto-machine, affording a cheap and abundant supply of electricity, immediately rendered practical all the half completed inventions of thirty years, and opened the way to many new ones. Brush got his patent in 1877, Weston soon after, and the growth of the electricity division has been steady and marvelous ever since. The inventions have been, however, rather in the application of known principles than in the discovery of new ones; for, during the fifty years that have elapsed since the investigations of Faraday, little new has been added to the science of electricity. The present activity springs from the application of well known exhibitions of the still unknown force. And, moreover, only a few of these features of the science have been as yet made of practical use.

One of the broadest and most successful patents appears to be the telephone. The man whose name is perhaps more widely known than any other in connection with inventions in this branch of invention is Edison. The "Wizard of Menlo Park" is an inventor rather than a scientist. His most famous achievements have been in the improvement in telegraphy and in the incandescent light. The versatility and fertility of his mind are amazing, and he enjoys the distinction of being the man who has taken out more patents than any one in this country and probably in the world.

Generally patents do not discover and cover new fields. By far the largest part consist of improvements affecting details. Thus, of the twelve hundred or more electricity patents issued in 1882 only a few possess a general interest. A singular feature in patents is the tendency to come in groups. At one time some particular subject, such as electric bells, seems to occupy the attention of inventors; then their minds will be turned in the direction of motors or lighting. Perhaps the leading tendency of late has been toward secondary batteries, or what is called the "storing" of electricity. It is well known that if the two terminals of a circuit, each of which is tipped with a small lead plate, are inserted in a vessel of acidulated water, so that the water will complete the circuit, a passing current of electricity will rapidly decompose the water into its two constituents, oxygen and hydrogen, the oxygen collecting at one terminal and the hydrogen at the other. If now they are allowed to unite again, the recombination gives out a current into a wire which is the reverse of that which effected their separation. Thus, as this form of battery can be charged at one time or place and discharged at another, it forms a most useful portable source of electricity. The popular conception of a secondary battery as a store box, in which electricity is bottled up like soda water and drawn off at will, is very erroneous. There is, to be sure, a "condenser," which actually stores up electricity; but a secondary battery, ready for use, contains no electricity whatever. It is simply an apparatus whose elements are in such a chemical condition that, upon their being placed in external electrical connection, a current will be generated therein.

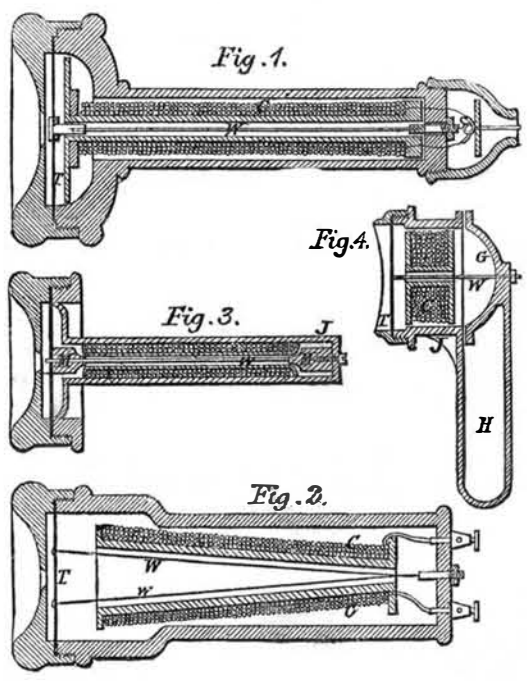
There can be no doubt that galvanic batteries, both in the simple and secondary form, are destined to play an important part in the application of electricity to common use. It is to the magneto-electric machine, however, that we look with most confidence. Electricity already is very serviceable to man. It sends our messages, calls the servant, gives an alarm of fire, announces the stealthy entrance of a burglar, regulates the temperature of a room, locks doors and windows, lights the gas, and does a hundred other services. In short, wherever it is wished to produce a mechanical movement at any distance, electro-magnetism is a ready, cheap, reliable, and tireless servant. On a large scale electricity as a motor is only useful in transferring power to convenient localities, as when a machine which generates a current is driven by a distant waterfall, but the translation of power into electricity and then its retranslation from electricity into power entail such losses that the electric motor must remain subordinate to steam, water, or other original force until a new and cheaper source of electricity is discovered.

THE REIS-THOMPSON TELEPHONE RECEIVER.

Professor Silvanus P. Thompson has lately devised, says *Engineering*, a new form of telephonic receiver of the type originally invented by Phillip Reis. In the Reis instrument the telephonic currents are received in a coil of wire surrounding a needle or rod of iron or steel mounted upon a suitable sounding box of wood. The variations of the strength of the current produce variations in the degree of magnetization of the needle, which, in consequence of the molecular changes thus set up, emits sounds. The final result of such molecular changes is, in general, to produce either an expansion or a contraction of the needle. If it be iron, steel, or cobalt, an increase of magnetization will cause it to expand in the direction of its magnetization, while if it be nickel, the contrary will take place.

In the well-known needle instrument of Reis, the sounds emitted are not loud, partly because the mass of magnetic metal is too great to permit the required changes in its degree of magnetization to be rapidly effected, and partly because the acoustic arrangement of the parts is defective and inconvenient. Professor Thompson's improved instruments are based upon the same principle of utilizing the expansion and contraction arising from the molecular changes set up by the varying degree of magnetization due to the telephonic currents, and the improvements relate to various methods of obviating or avoiding the defects of the Reis instrument, while preserving and developing its fundamental principle.

The figures annexed illustrate four of the forms that the instruments may take, similar parts being indicated by like



THE REIS-THOMPSON TELEPHONE.

letters of reference in each case. In the example shown in Fig. 1, a thin rod or piece of wire, W, of iron, steel, or cobalt, is fixed by one end to the center of a tympanum, T, of mica, horn, ebonite, sheet metal, or other suitable substance. Its other end is fixed to an adjusting screw or pin, S, by means of which the rod can be strained to any degree of tension. C is a coil of wire wound upon a tube of sufficient diameter not to interfere with the vibrations of the central rod. The combined tympanum, wire, and coil are inclosed in a case of convenient form, having an ear piece.

The general action of the instrument is as follows: If the current received in the coils, C, through the line from the transmitter increase in strength, it will change the molecular condition of the central rod, causing it to elongate slightly if of iron, steel, or cobalt, or to contract slightly if of nickel. A decrease in the strength of the currents will be followed by a partial demagnetization of the central rod, producing an inverse movement. Hence, as one end of the rod is tightly screwed up to the case of the instrument, the varying or fluctuating currents will cause corresponding vibrations of the tympanum. This telephonic receiver, when connected up with any suitable transmitter, reproduces sounds much more loudly than the original Reis needle instrument, and its articulation, especially of the sibilants and of some other consonants, is much clearer and more distinct than that of the common magneto-telephonic receivers.

In the form of instrument shown in Fig. 2 there are two wires, W and *w*, attached to the tympanum at different points, but terminating in a common adjusting screw, and surrounded by one coil. The wires may both be of iron or steel, but a better effect is obtained if one is of iron and the other of nickel, so that while one is expanding the other is contracting. Fig. 3 illustrates a modification wherein the ends of the central wire, W, are embedded in masses, M, of magnetic material, in order more effectually to produce its magnetization. One end of the wire is connected to the tympanum and the other to the closed end of an iron tube, J, which serves as the case of the instrument. In Fig. 4 the iron case, J, is shown wide and short, and provided with a bent handle, which carries an iron cup, G, to the center of which the wire, W, is screwed, the spring of the bent handle being serviceable to keep the wire in the proper condition of tension.

Status of the Telephone Patent Case.

The great interference case in relation to speaking telephones has not yet been decided by the United States Patent Office, although the arguments were closed on November 10, 1881, or more than one year ago. The interferences were preliminarily declared on March 26, 1878, the interfering applications and patents being those of Messrs. A. G. Bell, E. Berliner, A. E. Dolbear, Thomas A. Edison, Elisha Gray, A. G. Holcombe, James W. McDonough, and George B. Richmond. These interferences apparently involved at the outset eight different persons, two patents, and fifteen applications. Subsequently, Messrs. Berliner, Holcombe, and Richmond went out of the contest, either by default or their own concessions, and Mr. William L. Voelker was taken in. Recent developments in regard to transactions in telephone stock and other commercial movements in the telephone business give this great interference case an importance which at one time it did not have.

There are apparently six parties to the case—Messrs. Bell, Gray, Dolbear, McDonough, Edison, and Voelker. All had filed applications for patents upon inventions for transmitting speech by electricity, and to Bell patents had been issued. The interferences were declared by the Patent office, and the examiner was directed to determine to whom priority belonged. There are many complications in the case, and it is unnecessary to describe them now. A well informed electrician says that, in fact, there are only two parties to the case, and that these are McDonough and the interests controlled by the American Bell Company and the Western Union. Bell's application is, of course, in the interest of the Bell Company; Voelker, he says, is controlled by the Bell Company, through the Western Union, and by the Western Electric Company; Edison's interest is controlled by Bell, through the Western Union Company; Dolbear's interest is controlled by the Bell Company, and Gray's interest is controlled by the Bell Company, through the agreement with the Western Union. So the fight, according to this gentleman's statement, is McDonough against the field and against the Bell and Western Union combination. This combination was established after the suit for infringement brought by the Bell Company against Peter A. Dowd. In that suit testimony was taken, and then an agreement was reached that the Western Union should turn over to the use of the Bell Company all the telephone rights and patents in controversy; that the Bell Company should not interfere with the Western Union's telegraph business; and that the Western Union, or that part of it known as the American Speaking Telephone Company, should receive twenty per cent of the Bell Company's gross earnings.

It appears, therefore, that McDonough is the adversary of the established telephone interests in the great interference case. McDonough's interest is controlled by the United States Telephone Manufacturing Company, of New York, and it is said that this company, which has no plant as yet, has more than eighty valuable patents, some of them absolutely essential to the telephone business. In support of these patents the company has sued the Bell Company for infringement in New York and New Bedford, for using the telephone switch, and in Hartford for infringement in using what is alleged to be the McDonough receiver. These suits are pending. When the interference examination began in the Patent Office, the Voelker interest was, it is said, controlled by the Western Electric Company, but the controlling interest of the Western Electric Company has since been bought by the Bell Company. No one seems willing to predict the result of the interference case, although advocates of McDonough seem confident that this decision will favor him so far as the telephonic receiver is concerned. It is probable that whatever the result may be, an appeal will be taken to the full Board of Examiners, and perhaps afterward to the Commissioner of Patents.

The most formidable adversary of the Bell Company, so far as patents are concerned, is the United States Company, which controls the McDonough patents. The Bell Company's success in the Dolbear suit is not regarded as an important victory by some persons in Washington, and the suit at Harrisburg, based upon an injunction secured by the Bell Company, relates to the inventions of Drawbaugh, who is so far behind in the Patent Office that he is not included in the interference case. The McDonough company is, however, aggressive, and the decisions in its several suits against the Bell Company are awaited with considerable interest.—*The Operator.*

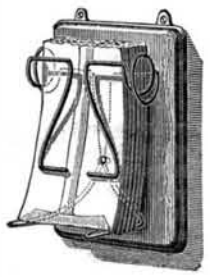
Melting Point of Fats.

Kratschmer conducts this experiment by bringing the substance to be tested into a capillary tube, placing a drop of mercury upon it, and then sealing the upper end of the tube. At the moment when the body melts, the drop of mercury sinks. The experiment can be repeated as often as desired with the same specimen.—*Zeitschrift für Analyt. Chem.*

RECENT INVENTIONS.

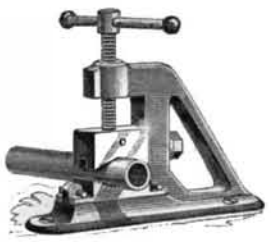
New Paper Bag Holder.

The engraving represents a device for holding paper bags in a compact and convenient shape, so that they can be readily removed when one or more is desired for use. The holder consists of a wire spring of peculiar form, arranged to press upon the bags and follow them down after the removal of one or more, so as to keep those remaining securely in place. To a base-board are attached the holding springs by one or more screws. The springs are formed of a continuous piece of wire, the ends of which are firmly attached at the screw near one end of the board. From that point the two portions extend upon the face of the board to near its end, where they are bent outward at right angles and then bent to form the rings that project upward from the face of the board. They are then bent inward from the outer edges of the rings toward the middle of the board, and form a loop that extends to the screw. The rings form springs which tend to press the outer end of the loop down upon the board or the bags placed thereon, and at the same time the two arms extending from the screw allow the lateral separation of the rings, so that they may receive bags of different widths between them. Below the screw are fixed arms or supports, upon which the bags rest. In use, the holder is to be hung up or placed upon a counter or shelf, and the loop being raised and the rings pushed apart the bags can be readily inserted and will be held by the pressure of the loop and side pressure of the rings. To remove a bag it is only necessary to take hold of its lower end at the supports and draw it out, and both the face and the side springs will retain the remainder securely in place. This device is simple, inexpensive, and exceedingly useful. The invention has been patented by Mr. Orrin P. Kenyon, of Wakefield, R. I.



Improved Pipe Vise.

This pipe vise has a double inclined shifting jaw, whereby the power put on the pipe held in the vise will tend to cause the pipe to be held with still greater firmness than by the screw alone, thus obviating all danger of the pipe turning between the jaws and becoming marred and injured. The upper jaw is made with double inclines on its lower surface and has the lower end of the screw swiveled in it. This jaw is formed with a single side arm, which is guided between the vertical uprights. The lower jaw has notched double inclines and thin flat end pieces, and rests flat upon the bed-piece of the frame, with the end pieces reaching under cross-pins, which serve to hold the jaw in place, but do not interfere in any manner with the free movement of the jaw endwise through a limited space. The lower jaw having double inclines and being held loosely in the frame of the vise, it will be seen that when the turning power is applied to a pipe grasped between the jaws any tendency of the pipe to turn will slide the lower jaw, causing the inclines to grasp the pipe with increasing firmness, according to the power applied to the pipe, so that there will be no danger of the pipe slipping or turning between the jaws, and being thereby cut or injured. This invention has been patented by Mr. Alfred Beard, of Danville, Ill., who may be addressed for further information.



What Does Our Clothing Weigh?

The medical profession, unable to cure all the ills that flesh is heir to, looks eagerly about for some one on whom to lay the blame. Climate, soil, geographical position, and all our habits of life have in turn been accused of causing disease. From time to time our worthy contemporary, the London *Lancet*, sounds the tocsin, declaring that it has discovered a new cause of alarm. Some article of food, drink, or clothing is selected for attack as being the key to all our misery.

The last freak of the alarmist is accusing women of wearing *too much* clothing. Hitherto, the cry has usually been that women's dress did not sufficiently protect them from the weather, and it was no doubt true, as applied to costumes worn at the Queen's "drawing rooms." But since the introduction of cork soled boots, felt hats, ulsters, and overcoats, and their general adoption by the fair sex, this cry has been silenced, and the *Lancet* now accuses them of going to the opposite extreme. Sealskin sacks, fur lined dolmans, and quilted silk circulars were the objects of its last attack. This, too, in spite of the fact known to every scientific mind that fur and cotton wadding afford far greater protection against the cold than the same weight of any other material, feathers alone excepted. A man's ulster, or even a quilted overcoat that would afford the same amount of warmth, or more properly speaking, keep out the same amount of cold, would weigh far more. In Northern Europe, especially Russia, and to a less extent here, fur lined garments are worn by both sexes, nor does any one think of calling them *heavy* until a warm spring sun renders them unnecessary.

In the days of heavy woolen or quilted petticoats physicians complained of the weights thus suspended on the hips, and asserted that they must be hung from the shoulders. Fur lined garments for both sexes fulfill this condition, while the loose fitting style of those worn by women confine a considerable quantity of air, that best of non-conductors, between them and the body.

Impressed with the importance of the *Lancet's* remarks, and perhaps hoping to check the extravagant custom of wearing these cloaks, the reporter or a New York daily visited several stores and weighed these articles, with the following results:

WOMEN.			MEN.		
Sealskin dolmans,	6	pounds.	Dr. Sayre's ulster,	20	pounds.
Fur lined "	5	"	Average ulster,	15	"
Fur lined circular,	4	"	Winter overcoat,	8	"
Sealskin sack,	4	"	Lighter "	6	"
Silk dress,	3½	"	Suits, average,	6	"
Plush "	5¼	"	" cheviot,	4	"
Velvet and cloth sack,	6	"			

Skirts were found that weighed from 9 to 12 pounds, and a ball dress of satin and plush was *estimated* at 12 pounds.

He also visited several prominent physicians, both male and female, from many of whom the *Lancet's* theory received but little support. Even the old and partially accepted theory that the hips must not be allowed to bear any load was also exploded. In many persons the hips are better able to bear the weight of the nether garments than the shoulders, pressure on which tends to cause stooping, thus contracting the breathing space and inducing lung complaints, since it is the upper and not the lower end of the lung that is most liable to disease.

One point, however, was insisted on by all physicians of city experience, namely, the advantages of well made and properly fitting corsets. If well boned, they prevent the tightest skirt bands from pressing in upon the vital parts, but when old they become injurious, as the ends of the broken bones not only press inward, but sometimes penetrate the flesh. Dr. Weir spoke of a hospital case that had come under his notice in which a woman's liver was almost cut in two by wearing skirts tightly around her waist with *worn out* corsets. A lady physician also writes, that "badly fitting corsets and broken steels produce great suffering among poor girls." Several other physicians said that weight hanging from the hips could do little or no harm, and the muscles of the abdomen are strong and well arranged for withstanding strain. Weight supported at the waist comes on the hip bones, and is borne chiefly by the legs, and can be carried more safely from the waist than from the shoulders.

There are many men who wear no suspenders; they need none because their hips are prominent and easily support the pants, which hang on them as on hooks; others would need to buckle their pants so tightly to prevent dragging down as to be injurious, for this reason; that they do not wear any corsets, hence the belt presses in upon the liver and other vital organs. A pair of winter pants, the pockets partially filled with knives and keys, to say nothing of silver dollars, more than equals in weight the skirts *usually* worn by the other sex.

Men's theories of woman's dress is always faulty, not being drawn from experience. With the advent of competent, educated, and experienced female physicians, ladies of taste and refinement who dress as fashionable ladies do (and we claim that they ought to do this, if only for the experience they would gain from it), we shall expect to see our medical exchanges filled with correct criticisms of such articles of dress as are actually harmful, and not with senseless tirades against such useful and healthful garments as are usually the subject of attack. When the medical criticism of woman's dress has been turned over to female physicians, the male members of the profession will have time to criticise their own clothing, and may be induced to cast this beam from their own eye, and relieve us from some of the tyrannies of dress.

Railroad Inventions.

The *Age of Steel* echoes what inventors of railroad improvements often complain of, and that is that railway officials do not seem to want anything new. No matter how good an invention may be no railway man wants to see the invention or the inventor, nor does he even care to talk about it. The inventor may propose to haul a train of cars from New York to Washington, not only without expense, but to make money by selling water from the water tanks to people along the line, so as to make running the trains a double source of economy, yet the railway man consigns the inventor to the firebox of eternity, and proposes to see him well on his way in that direction. The poor inventor feels that he does not deserve any such treatment, complains, and wonders why it is such hard work to deal with railway men. If he does succeed in making a really valuable invention, why is it that he must put it on to trains himself, watch it at every step of the way, and do this all at his own expense? That it is so, every inventor and every railroad man knows perfectly well.

It would seem as if enough wheat might be found among the chaff to warrant railroad officials spending a little time examining inventions brought before them. They would thus encourage the inventor to further research and experiment in the railroad line, from which something good to the community and railroad companies might eventually come, if some of the inventions submitted were found lacking in practicability

Bogus Inventions.

Letters patent protect two class of individuals occupying the extremes in the inventing world. First, those who study a subject with the intention of honestly improving it; second, those who study the movements of the first class and steal everything they can. All honor is due to the honest man who, by patient experimenting, close application, deep study, and much expenditure, produces a device destined to make more subservient the forces of nature. This man makes himself familiar with what has been accomplished in the particular branch to which he is devoting his attention, and then seeks to push it another step toward perfection. We cannot throw our glance to any point in the civilized world without meeting overwhelming evidences of his unremitting labor.

The second division steals the work of the honest inventor. The smallness and apparent insignificance of these things never affect the zeal of the pirate. His attentions are given to the big and the little; sometimes the latter is preferred.

From these simple facts has arisen the holy horror in which every honorable member of the profession holds these people, and the dread he has of showing the result of his work before he has filed his claims, for fear his idea of a bolt of peculiar construction may be stolen. The thief knows that a machine which would do that particular work successfully would be valuable; he also knows that peculiar bolt is vital; consequently, if he can control the use of the bolt, he has, practically, the controlling use of the whole thing. The only redress is now in the courts, and as the choice between the thief and his royalty and the lawyer and his fee is about even, a compromise is effected, and the peculiar bolt has made the fortune, not of its creator, but of its owner.—*Engineering News.*

The Patent Office Surplus Fund.

Referring to the fact that there is in the United States Treasury more than two millions of dollars to the credit of the Patent Office, one of our contemporaries aptly suggests that it is absurd that more than $400,000 should be added to the fund in a single year, when every employe in the office is overcrowded with work to such a degree as to cause unnecessary delays and hurried examinations. A reasonable portion of the annual surplus in the payment of salaries to an additional force will do much toward reforming existing evils. The Patent Office should be provided with a sufficient examining force to enable every application for a patent to be acted upon within a fortnight at most after the filing of the papers. Inventors are naturally impatient to get a decision in their cases as soon as possible, and from their generous support of the Patent Office they are entitled to more consideration than it is possible for the present force of the office to grant them. If our legislators would take the trouble to investigate into the wants of the Patent Office, and then vote a sufficient sum from the Patent Office fund to enable the Commissioner to employ all the help he needs to keep the work of the office well up, they would be instrumental in doing some good.

Use of the Microscope in Brewing.

Not only is an impoverished yeast unable to develop an active and healthy fermentation, but being itself so weak it is less able to battle against the different disease ferments, which always become more active as the yeast itself loses its vitality. The persistent use of the microscope is, says the *Brewers' Guardian*, the only means by which the necessity for a change of yeast can be recognized, and therefore the yeast from each brewing ought to be examined from day to day; as soon as the cells are observed to lose their rotundity, to elongate, and to acquire something of the shape of the figure 8, it is a sure sign that some deterioration is taking place, and when the cells become filled with granular matter it is certainly time to make a change, for the yeast must then be seriously weakened. Simultaneous with these alterations in the appearance of the yeast cells the careful observer will be sure to find that numerous other organisms, such as bacteria, lactic and other diseased ferments, begin to make their appearance, and if the use of such a yeast is persisted in, the resulting beers cannot long remain sound and with a proper and normal flavor. Frequent and unnecessary changes of yeast are to be deprecated, but it is far more serious to continue to use a yeast when once degeneration and deterioration have set in.

Popular Science.

The following, says the *Chemical News*, is from a recent number of the *Ashton Reporter:* "Water carried as Gas.—M. Pasteur, a nephew of the celebrated chemist of that name, has recently adapted an old discovery to great practical use. It is a well known fact that the crossing of the great African desert is accomplished by means of caravans composed of camels, horses, etc., the water for which has to be transported on the back of the consumer. This lessens to a great degree their freighting capacity. M. Pasteur has established suitable works at the numerous termini of the routes for separating the water into oxygen and hydrogen. As the latter is sixteen times lighter than the former, and is the gas used in balloons, it carries the oxygen and a considerable part of the camel, besides furnishing light on dark nights. He unites the gases by the simple means of explosion when desired for use. The French Government has created M. Pasteur a commander of the Legion of Honor for his great adaptation."

ENGINEERING INVENTIONS.

An improvement in screw cutting attachments to ratchet drills has been patented by Mr. William M. Turner, of Pensacola, Fla. The ratchet works either right or left handed, for cutting right or left hand threads, and for drilling, or turning screws, in situations where the ordinary ratchet will not work. The invention consists also of a novel attachment for feeding the drill.

An improved car coupling has been patented by Mr. Edward M. Richardson, of Laconia, N. H. The invention consists in a drawhead in which is pivoted a block having its outer end forked. Between the shanks of the fork a cam is pivoted whose lower edge is curved and its upper edge provided with side projections. The coupling pin rests on the upper edge of the pivoted cam, and when the link enters the drawhead it raises the cam, whereby it will be moved from under the coupling pin, which drops and passes through the link into the drawhead.

An improved steam tuyere has been patented by Mr. Lewis G. Heybrock, of Omaha, Neb. The invention relates to a tuyere operated by a steam jet, for use with smelting and other furnaces, also with boiler furnaces, for promoting combustion, and the operation of the tuyere is to inject a mixture of steam and air into the fire, thereby causing more complete combustion and more intense heat. When used with a forge, the tuyere is placed in the same manner as an ordinary tuyere. In smelting furnaces or any furnace intended for heating, smelting, or refining metals, the tuyere is to be placed so that the jet shall strike the flame at a point where the greatest heat is required.

An improved refrigerator car has been patented by Mr. Benjamin N. Bugbey, of Sacramento, Cal. The invention consists of a layer of clay, plaster of Paris, or other porous absorbent material, located between the outer shell of boards and an inner partition of the car. Perforated pipes are arranged for the circulation of water throughout the clay or plaster for saturating it, and which produces a cooling effect by evaporation. A layer of pulverized charcoal is closely packed between the partitions of the sides of the car. This charcoal answers the double purpose of keeping the articles *in transitu* sweet, and at the same time affords an excellent non-conducting substance.

MECHANICAL INVENTIONS.

Mr. Edson L. Bracken, of Dawson, Ill., has patented an improved knotting mechanism for grain binders. This invention is of rather intricate device, and engravings would be necessary in order to give an adequate description.

Mr. Frank X. Myer, Jr., of Logan, O., has recently patented an improvement in that class of wagon wheels in which metal rods are used for the spokes. The hub, in which the spokes are secured, has flanges for the ends to rest in, and when completed, the wheel has a light and graceful appearance and is very elastic.

Mr. Andrew J. Conner, of Louisville, Ky., has patented an improved machine for preparing tin plates for roofing by uniting the ends of a series of tin plates in such a manner that they will form one continuous roll, band, or strip. The machine at the same time cuts the edges of this strip of metal smooth and even, and in a continuous straight line.

An improved wrench has been patented by Mr. Loyd H. Swan, of Oxford, Ind. The object of this invention is to facilitate the tightening of the nuts on railroad joints, and the novelty consists in the mode of supporting the wrench by a frame attached to the track and a pair of horns connected to the frame for holding the frame in place, and prevent the bolt from slipping.

A simple drawing roller for spinning and drawing frames has been patented by Mr. George Hill, of New York city. The roller is made of shreds of leather of all kinds, which are mixed with glue and oil in suitable proportions. This mass when thoroughly mixed is moulded and pressed around a mandrel of metal, the periphery of which is grooved to receive the leather mass which is pressed upon it.

An improvement in horse power sweeps for grinding mills has been patented by Mr. Edward M. Wilcox, of Whitewater, Wis. The object of the invention is to relieve the mill of the one sided pressure occasioned by the weight of the sweep itself, and it consists in attaching to the end of the sweep an iron arm carrying a caster wheel or roller, which rests upon the ground and supports the weight of the sweep.

An improved felly tightener has been patented by Mr. Archimedes Galbraith, of Amadore, Mich. The invention consists of right and left threaded screws which work within internally threaded bars, the latter of which have jaws for clamping to the felly, and two pairs of fastening bars, together with certain other provisions for tightening the fellies, either by drawing or pushing, without removing the tire, and, if necessary, without removing the load which may be upon a wagon.

An improved automatic weighing scale has been patented by Mr. Nicholas A. Jones, of Leavenworth, Kan. The invention relates to a machine for weighing and filling from a cask, bin, or other bulk supply into packages of stated quantities any material which will flow through a spout. A valve operating mechanism is connected by a connecting rod with the steelyard of the scales, for cutting off the flow of the material when the required quantity shall have been filled into the package.

Mr. Fish Eccles, of Auburn, N. Y., has patented a novel and improved grinding and polishing machine. This invention consists essentially of a chuck for holding hollow ware to be ground and polished on the inner surface. The article is mounted by a pivotal connection upon the carriage by which it works to and from the emery ball, and is so geared with a feeding screw and a spring that the chuck turns on its pivot to present the irregular surfaces of the vessels to the polishing ball.

An improved machine for sawing and channeling roof boards has been patented by Mr. Daniel W. Williams, of Springville, Cal. The improvements consist of automatic feeding, reversing, and setting gear, whereby two bolts may be applied to the saw at one and the same time, one being fed up to the saw while the other is being run back for resetting. The inventor attaches to the frame, gauges in advance of the saw, so that the bolts will be grooved on the under side at the same time that the boards are sawed off.

A novel camera shutter, which operates in such a way that the camera may be operated by a person at some little distance, has been patented by Mr. Charles H. Scofield, of Utica, N. Y. The invention consists of a flexible tubing connected with a camera shutter, and so constructed that when air is forced into the former for distending it, the shutter of the lens aperture will be removed. The air is forced into the tubing from a rubber bulb or reservoir held in the hand of the operator, and connected with the former by a rubber pipe which may be of any length as required.

An improved foot power has been patented by Mr. Arthur W. Bush, of Boulder, Col. This invention consists in a contrivance for converting a treadle motion into rotary motion; and it consists of a shaft carrying a driving pulley with a ratchet collar affixed thereto or to its shaft, and a clutch loose thereon, and having a stud or projection combined with a drum provided with a sleeve or collar inclosing the said ratchet and clutch, and having an oblique slot, which receives the clutch, stud, an intermediately coiled rope or its equivalent, a treadle, and a carrier roll or pulley.

A box nailing machine for making cigar or similar boxes has been patented by Mr. Samuel Avery, of Phœnix, N. Y. This invention possesses considerable novelty, and by its use it would seem to be a great labor saving machine. There is provided an inclined slide down which the nails are passed, the imperfect ones falling through the opening in the slide into a receiver below, while perfect nails pass down until they fall into position to be driven into the box. This feeding and driving operation is accomplished by a sliding driver operated by a treadle, which not only inserts the nail in the box with accuracy and precision, but drives it home. As many slides as desired may be arranged parallel to one another, all of them being operated in the same manner and with equal facility.

An improved fence loom has been patented by Messrs. Daniel E. Merrick and George Q. Adams, of Quincy, Ill. The machine consists of means for twisting the wires between the pickets, the wires being drawn off from suitable spools attached to the machine. The machine also consists of means for feeding the pickets between the strands of wires, of means for moving the pickets outward just before the wires are twisted in the rear of them, of a winding drum for receiving the web of pickets, of means for giving the winding drum intermittent movement, and of means whereby the distance of each intermittent movement of the drum is automatically decreased as the web accumulates on the drum, and of devices for regulating the movements of the different parts. The inventors suggest that their loom is equally adapted for weaving tarred rope or cords as it is for weaving wire.

A novel apparatus for cleaning cisterns, which obviates the necessity of withdrawing the water from the well or cistern, has been patented by Mr. Willis M. Prather, of Kansas City, Mo. In cisterns, wells, and reservoirs of water, sediment and filth of various kinds collect at the bottom, rendering the water unfit for use. Mr. Prather constructs an apparatus with a scraper and brush, so arranged that they conduct the sand or sediment of whatever kind to the center of the reservoir, where a barrel-shaped cylinder is located, in which a pump is so arranged as to take all the slime or sediment up through the cylinder without disturbing the surface of the water. To prevent the action of the brushes from fouling the water above the bottom of the pump barrel, there is inserted in the well a cover just the size of the cistern. This cover is mounted on a ring, and is provided with springs which facilitate its introduction into the cistern.

An improvement in the construction of the tower and turn table of wind mills has been patented by Mr. Ira W. Russell, of Storm Lake, Ia. On any suitable base are mounted four vertical posts parallel to each other and held in position by proper supports and braces, and on their upper extremity is located the turn table, mounted upon wheels, and which revolves on a groove prepared for it. The pump shaft passes up between the supports and gears with the horizontal or wheel shaft by bevel pinions. The arms of the wheel, which may be made of wood or metal, are bolted into a hub, and the vanes are pivoted on these arms in such a way as to cause them to be turned by the unequal pressure of the wind, and so that in case the wind becomes excessive the vanes will turned endwise, thus decreasing the speed, or stopping the wheel entirely. In this arrangement the wheel of itself swings around to the leeward of the tower, and does not require a tail to keep it in position.

AGRICULTURAL INVENTIONS.

An improved harrow, the invention of Messrs. Alexander Goodhart and George Hemminger, of Carlisle, Pa., has recently been patented, the object of which is to enable varying the angle of presentation of the teeth to the line of draught, and to allow the yielding of the teeth when coming into contact with an obstruction, to obviate strain upon the team and prevent breaking of the harrow.

Mr. William C. Moore, of Springfield, Mo., has patented an improved garden implement, combining a plow with a wheel barrow, intended for the use of market gardeners and farmers. The plow or cultivator is so arranged under the wheel barrow as to be folded up out of the way when not in use. A rake attachment may also be applied for smoothing the ground after the plow has done its work.

An improved cultivator has been patented by Mr. George Allen, of New Berne, N. C. The invention consists of a cultivator adapted for cultivating both sides of the rows of plants at once. To the rear end of an ordinary expanding and contracting harrow is attached a set of cultivator teeth supported on a cross tie to the central beam of the cultivator. An adjustable draught rod is provided, which allows the horse to draw obliquely to the cultivator, so that it will run along the rows while the horse travels between them.

Mr. Isaiah Hancock, of Fayetteville, Tenn., has patented an improved cultivator plow, in which the beams of the plow are united by means of curved pivot bars and straight holding and adjusting bars, so that the beams shall be rigidly held at any desired distance apart. The plow handles are united to both the plow standards and to the beams to make them firm, and their upper ends are adjustable. The plowshares are provided with auxiliary wings that may be attached or detached without removing the shares from their standards.

A novel combined hay rake and loader has been patented by Mr. Charles S. Dame, of Lanark, Ill. The forward part of the frame is provided with teeth hinged at their rear ends, and having shoes hinged to their forward ends, the said teeth resting upon a trip bar suspended from the frame by connecting rods and bent levers, so that the teeth can be readily raised from the ground. The rear part of the machine is provided with a carrier and an adjustable elevator. The inclination of the elevator may be regulated to any degree required, to receive the hay or grain from the teeth and deposit it upon a wagon or in a window.

An improved bundle separating attachment for self-binding harvesters has been patented by Messrs. Charles A. Ruddock, of Benson, and Nathan S. Ruddock, of Granite Falls, Minn. The invention consists in the combination with the binding table of a self-binding harvester, of a V-shaped supplementary table secured to the edge of the binding table, and a curved arm projecting from the outer edge of the supplementary table, which device serves to facilitate the separation of tangled and intermingled bundles of grain, and prevents the discharged bundles from drawing upon the grain being bound, and also prevents the pulling of the binding wire or cord out of place, and disarranging the binding mechanism.

Mr. John G. Coburn, of South Carthage, Me., has patented an improved dumping wagon. A friction wheel is mounted on an axle, on which one of the driving wheels is locked, to cause the friction wheel to rotate with the driving wheel. Between the friction wheel and the bottom of the wagon box a smaller friction wheel is jammed, this smaller friction wheel being journaled in the ends of adjustable hangers loosely mounted on the sides of the large friction wheel. The wheel is locked on the axle by means of a clutch ring operated by a rope or chain extending to the front end of the wagon. This rope runs over a pulley on a rocking shaft which is attached to the front axle. The rocking shaft is provided with a handle lever, by which the operator discharges his load.

An improved corn planter and cultivator has been patented by Mr. John C. Weiss, of Pittsburg, Kan. The invention consists of a frame mounted on a pair of truck wheels, and carrying a plow through which the corn is dropped from the hopper to be covered by the earth falling in behind the plows, and by rollers located behind the hopper to pack the earth over the corn. The slide in the bottom of the hopper is opened by a lever which is operated automatically by tappets connected with pinion wheels to the axle of the machine, and which is set in motion by the revolution of the wheels of the machine. The dropper slide, by means of levers, may be operated by hand, and the automatic system dispensed with. The wheels of the machine are placed the distance of three rows or twice the distance of the hoppers apart, so that they constitute a self marking device, by running one wheel in one of the tracks previously made.

MISCELLANEOUS INVENTIONS.

A lead pencil, so constructed that the lead may be clamped in any desired position by means of a spring actuated clamp has been patented by Mr. Jacques Senn, of New York city. A single piece of metal doubled upon itself, forming a split tube for the lead, with lateral double wings extending along a portion of the length of the tube and bearing against it, supports the tube, giving it increased strength.

An improvement in setting window panes designed to fasten glass panes in sashes without the use of nails, pegs, or putty, has been patented by Mr. Theophilus Tanner, of Osage, Neb. This invention consists in a rubber strip provided with a longitudinal slot increasing in width toward its interior. The window sash has end and cross pieces provided with a groove to receive the strip which holds the glass.

A new prepared flour has been patented by Mr. Philip Thorpe, of New York city, the object of which is to manufacture a prepared flour which needs only to be mixed with water to form a dough for use. The invention consists in thoroughly incorporating butter deprived of its water with flour and baking powder mixed together in the proper proportions, which will keep for a long period, and requiring only the addition of water to form a dough.

A novel book rest and manuscript holder, provided at the same time with a reading mark and eye protector, has been patented by Mr. Charles C. Koehl, of Paterson, N. J. The device consists in a plate provided with springs for holding a book, and with a curtain attached to a roller, which curtain is raised or lowered to cover that part of the book or sheet that has been read, and thus forms a book mark and an eye protector.

An improved wagon rack has been patented by Mr. Abraham Landis, Sr., of Elkport, Ia. By this invention a wood rack is readily converted into a hay rack, which is also adjustable to proper conditions for carrying bags of grain and the like, and has an attachment for securing the binding pole usually employed to secure the hay on the rack, said attachment being also useful as an end gate attachment to facilitate the loading of heavy products.

Mr. Ferdinand King, of Atlanta, Ga., has patented a novel direction plate and label holder for cars, the object of which is to indicate to passengers and trainmen the destination of said car. It consists in a metal frame composed of two plates having a central chamber with a glass in front, which chamber holds a card bearing an inscription and is retained by a pivoted door, the metallic marginal face of the plate being provided by casting or engraving with general instructions.

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) W. M. asks: 1. How many miles per hour will water run in a ditch or race with one-quarter of an inch fall per rod; said race being (we will say) 4 feet wide on top, 2 feet 6 inches on the bottom, and 3 feet deep, and conveying about 400 inches of water; said race having several moderate curves per mile? A. Making moderate allowance for friction of bends, 2·15 miles per hour. 2. How much fall should such a race have per rod in a tolerably tenacious subsoil, so as not to cut the sides? A. Should not exceed about 90 feet per minute.

(2) W. E. asks: 1. How is phosphorus dissolved, to be used in making parlor matches? Can you give us formula for mixing the ingredients? A. By referring to the SCIENTIFIC AMERICAN for January 27, 1883, a composition is given which is prepared as follows: The glue, broken in small pieces, is soaked in water till soft, added to the water, and dissolved by means of a water bath. The vessel is removed from the fire, and the phosphorus is gradually added, the mixture being constantly agitated with a suitable stirrer. When a uniform emulsion is obtained, the other substances are mixed in, one after the other, in the order in which they are named above, and the stirring is continued until the mixture is nearly cold. 2. What is the amount of revenue per hundred or thousand matches? A. One cent per 100 matches. Consult SCIENTIFIC AMERICAN SUPPLEMENTS, Nos. 87 and 353. 3. Also, what is the best temperature for preserving eggs in a cold storage room? How long can they (eggs) be safely kept? A. Consult article on "Preservation of Eggs" in SUPPLEMENT, No. 317.

(3) D. T. G. asks: 1. Is gas or coal tar good to preserve fence posts, and how is it applied to the posts? A. Coal tar is one of the agents most commonly employed for preserving wood on a large scale for pavements, etc.; but unless the wood is first thoroughly dried by means of hot air or steam, the superficial coating of tar has a tendency to confine the moisture in the center of the block. It is applied by painting it on or dipping the post into the mixture. 2 Can a telephone line be worked successfully without a battery a half mile? A. Yes.

(4) W. T. asks: In making good hard soap what proportion of caustic potash and sal soda are used in proportion to the fat or oils, and of what density should the potash be? A. The proportion of caustic potash and sal soda varies according to the fat or the oil which is used in the manufacture of the soap. Consult "A General Treatise on the Manufacture of Soaps," by Dussauce, which is probably the best work extant, in English, on the subject.

(5) M. W. M. asks: 1. Would a telephone, such as is described in SUPPLEMENT, No. 142, using No. 40 wire, work enough better than one using No. 36 to pay for the difference in cost of wire? A. No. 36 will answer very well. 2. What size office wire would it be necessary to use for connections on a dynamo electric machine, such as is described in SUPPLEMENT, No. 161? A. No 14 or 16. 3. Is the new form of transmitting telephone shown in SUPPLEMENT, No. 163, page 2563, Fig. 4, shown full size? If not, what of full size? A. It is about half size. 4. Please give a recipe, if you can, for an oil blacking for boots and shoes—one that will shine when rubbed with a shoe brush. A.

A. Molasses	1	pound.
Ivory black	1¼	pounds.
Sweet oil	2	"

Rub together in a Wedgwood mortar till all the ingredients form a perfectly smooth homogeneous mixture; then add a little lemon juice or strong vinegar—say the juice of one lemon, or about a wine glass of strong vinegar—and thoroughly incorporate, with just enough water added slowly to gain the required consistency.

B. Ivory black	2	pounds.
Molasses	1	pound.
Olive oil	¼	"
Oil of vitriol	¼	"

Add water to gain required consistency.

(6) E. S. S. asks: 1. When the atmosphere is the lightest—in clear or damp weather? A. The atmosphere is generally lightest in damp or wet weather. 2. Will the condensation in a whistle pipe return to the boiler while there is a pressure of steam on the boiler? A If the whistle pipe rises directly from the boiler, so that there are no traps to prevent the water from easily flowing back to the boiler, there will be dry steam in the pipe below the valve.

(7) E. G. T. asks: 1. Must the coils of magnets, as, for instance, in a telephone, be wound as perfectly and neatly as a spool of thread, or will they answer if made more roughly? I find it difficult to wind them neatly on a common foot lathe without special appliances. A. It is not absolutely essential to the working of the instrument, but on many accounts it is preferable to have the wire carefully wound. 2. Is common iron rod, such as may be found at a blacksmith's, suitable for electro-magnets? A. If soft, it will answer. 3. To make the strongest electro-magnets, should cells of the battery be connected for quantity or intensity? A. It depends on the construction of the magnet. See query 1, p. 91, current volume.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. G. S.—The sample is simply silicious sand, containing slight quanties of the oxides of aluminum and iron, with traces of magnesium and calcium oxides. It is of no special value unless it contains some of the precious metals. The sample sent was too small to examine for gold or silver, and from its appearance we do not believe that it contains either.—C. H. D.—Both samples are specimens of badly weathered limestone. They contain various minerals in a disintegrated state, with nearly all of the limestone dissolved by exposure. It is very likely that there is considerable iron and manganese among other minerals. Analysis would be necessary to determine its value, if any. For certain soils, powdered limestone is a valuable fertilizer. If desirable, an analysis could be made, which costs from $10 to $25, according to the ingredients present.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

February 13, 1883,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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

Advertising device, automatic, A. Anderson 272,184
Advertising device, revolving, I. J. French 272,174
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