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THE GREAT AMERICAN DREDGES ON THE PANAMA CANAL.

Many changes have been made in these mammoth dredges since the first one (described and illustrated in the SCIENTIFIC AMERICAN of March 3, 1883) was built, some three years ago. Experience gained in actual working showed that while the principle of construction was sound, many improvements could be made in the details; these alterations have resulted in increasing the capacity and durability of the machine.

The dredge shown in the accompanying engravings is the seventh one built by the American Contracting and Dredging Company of this city for work upon the canal; it differs from the previous ones mainly in the substitution of iron for wood in the tower, derrick, and ladder, and in having greater height of tower, greater length of ladder, and increased boiler power.

The composite hull of yellow pine and iron is 116 feet long, 36 feet wide at the after end, and 30 feet wide at the forward end; the sides are curved to a radius of 106 feet. The end of the hull, which is 12 feet deep, is rounded to a radius of 11 feet. In the forward end of the hull is a slot, in which the ladder moves, 36 feet long and 7 feet wide.

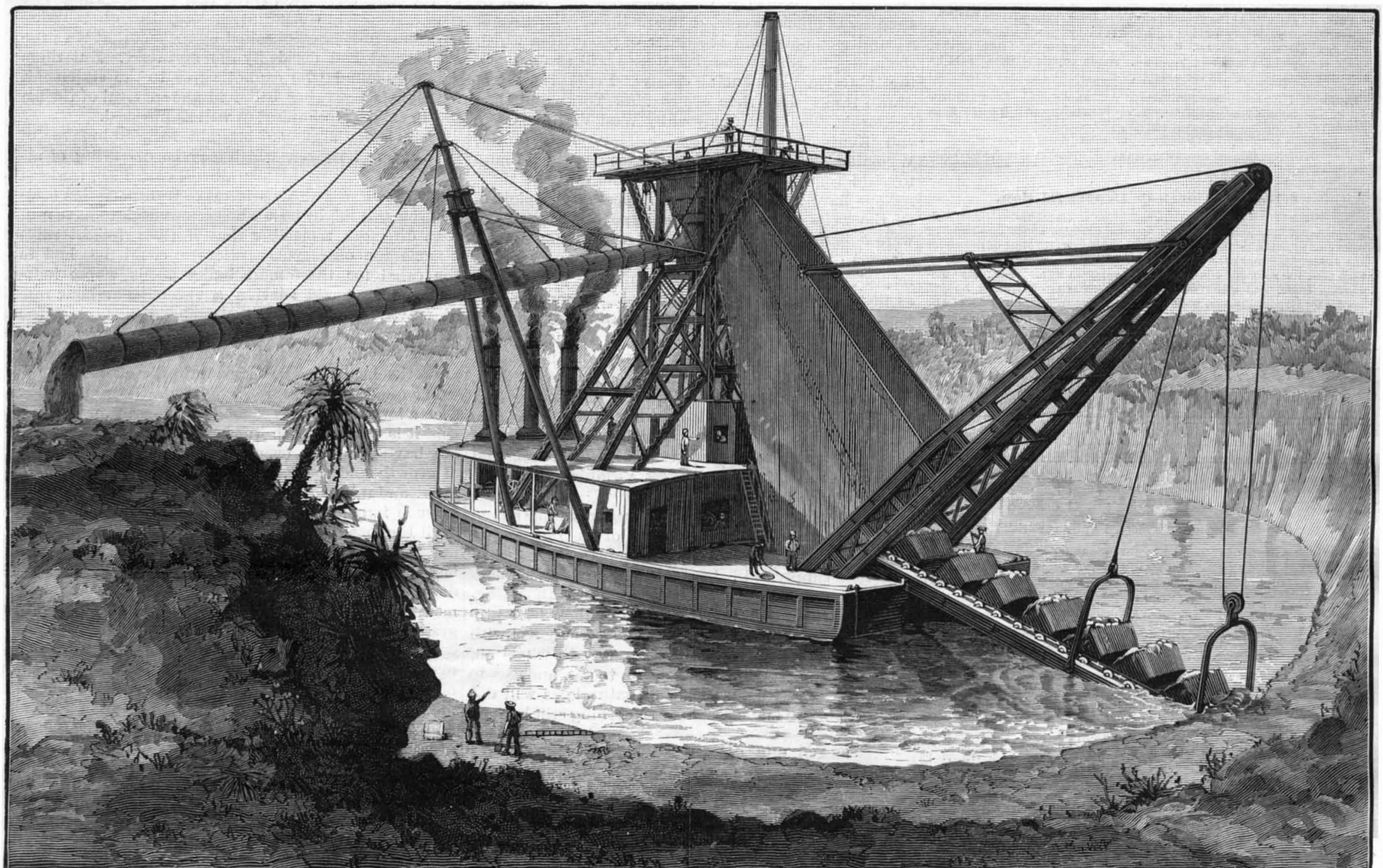

Fig. 1.—THE GREAT DREDGE AT WORK.

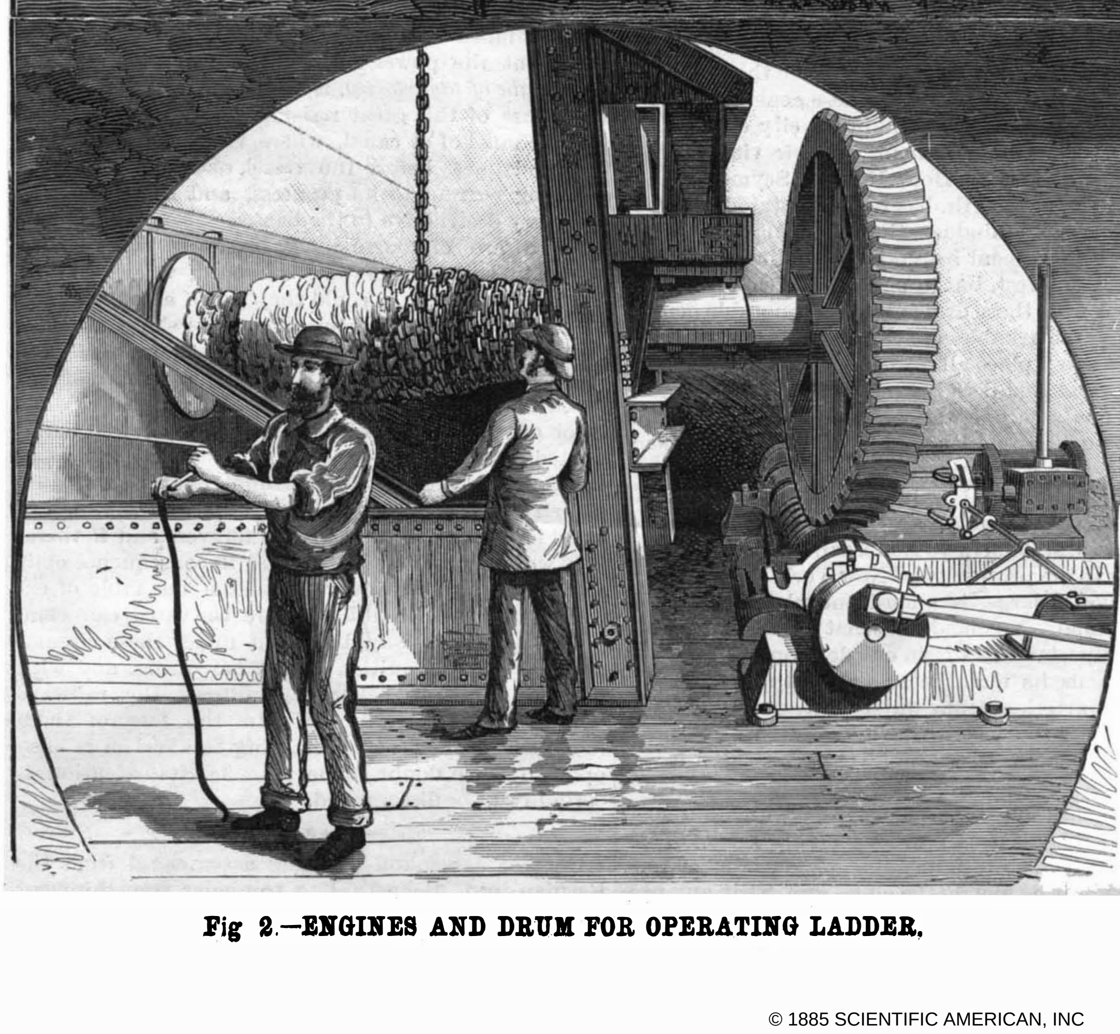

Fig 2.—ENGINES AND DRUM FOR OPERATING LADDER.

The two wooden spuds are 24 inches in diameter and 60 feet long, and are provided with iron chisel points weighing 1,800 pounds. Each spud passes completely through an opening in the hull, in which is vertically placed a cast iron tube, the interior of which is double-coned shaped, the diameter at the center, where the bases of the cones meet, being 25 inches, and the diameter of the ends 27 inches. This gives the spud a center bearing, and prevents binding during raising or lowering.

When working, the dredge is held by either spud being lowered. The spuds are handled by means of ⅞ inch chains passing through double sheave blocks to a drum operated by a pair of engines 8½ inches diameter by 12 inches stroke. A pinion on the engine shaft, which is 4 inches in diameter and 3¾ feet long, engages with a gear on the drum shaft.

From the inside of the bottom of the hull to the top of the tower is 70½ feet. The tower consists of six posts converging toward the top and arranged in two sets across the hull. The rear set is made up of 12¼ inch, and the forward set of 15 inch latticed channels, the whole being united by latticed channels and diagonal rods. The platform at the top, which is 38 feet long by 24 feet wide, rests upon three iron beams running longitudinally and supported upon the posts.

The outer parts of the platform are held by inclined braces attached to the sides of the tower. Two bars 1 by 2½ inches and 25 feet long extend from the bottom of the top panel of the tower to the extremity of the stern, and two bars 1½ by 4½ inches and 38⅝ feet long extend from the front of the

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NEW YORK, SATURDAY, AUGUST 15, 1885.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 502,

For the Week Ending August 15, 1885.

Price 10 cents. For sale by all newsdealers.

NATURAL GAS WELLS IN OHIO.

Drilling for gas was begun at the town of Madison, Ohio, by Messrs. Gunning and Sond on the 29th of June, and by the 14th of July the well had reached a depth of 780 feet. At this point a heavy vein of gas was struck. The well was continued down to 1,025 feet, about 200 feet of the distance requiring tubing on account of the influx of salt water. The pressure gauge at the mouth of the well registered 100 pounds. The parties named are now supplied with fuel and light.

The great value of natural gas has already been demonstrated at Pittsburg and neighboring places. So rapidly and completely has the substitution of gas for coal taken place, that the principal mills of Pittsburg are now using the new fuel. Oil in the days of the great excitement did not attract such broad attention as has the natural gas in the last year or so, and the wonder now is why we have never used it before. The area of its distribution is probably as large and almost coincident with that of petroleum. We know with a degree of certainty prompted by its commercial importance that our supply of petroleum comes from the rocks of the Devonian, which immediately underlie the productive coal measures, and it will be a matter of much interest to follow the development of natural gas, and note the order of production which the different States and Territories will assume. Of the petroleum producing States, Pennsylvania of course ranks first, then comes New York, and then California. These are followed by West Virginia, Ohio, and Kentucky. In the Rocky Mountain country, Wyoming, Colorado, and New Mexico have been found to yield some small quantities of the oil, but those regions have as yet been only imperfectly exploited. Of the wells opened over this large territory, many were *blowing* wells, and carried with them a large amount of gas, but there was no constancy in this respect, and no particular area could be pointed out as productive of gas above the rest. The whole subject is too new for any complete knowledge of the distribution of the natural gas, but so far as the point has been determined, our assumption of its general coincidence with the oil country seems to be justified. Whether, however, the same quantitative order that we have named for petroleum will follow in the case of the new fuel is still a question. As every one knows, it is already largely used in Pennsylvania and to some extent in Ohio, West Virginia, and other places.

Unless we regard the earth as a vast reservoir stored with gas, somewhat after the order of the Pintsch system of compression, we must contemplate a time when this fuel supply will become exhausted, and abandoned pipe lines will tell the same story as the decaying oil derricks. But the past of our industrial progress is a promise for the future; and we may feel with confidence that as the candle gave way to whale oil, whale oil to petroleum, petroleum to gas, and gas to electricity, so, with our fuel, that natural gas will disappear, only to make room for something still better.

SHALL OUR CANALS BE MAINTAINED?

The question of the maintenance of American canals is just now exciting a very lively interest, and not a little argument is being expended upon the advisability of their improvement and extension. The scheme for making the Erie a ship canal is particularly under discussion. A number of prominent people in New York city and throughout the State have taken preliminary steps to form an organization to promote the improvement of the New York canals. These gentlemen have called a conference, to be held in the city of Utica on August 19. The chief exponent of their views so far brought forward is the Hon. Horatio Seymour, who, in a letter of some length, has formally stated the reasons which should induce the maintenance of the canals. The document in question contains many facts of statistical interest, but to us they indicate different conclusions from those drawn by the honorable gentleman. Any remarkable development, such as that which has taken place all over the United States during the several past decades, presents a very tempting field for analysis; one wants to discover the specific causes for such prosperity, and, having reached them, to give them a wider prevalence. The motive is certainly most commendable, but its proper development requires a nice judgment.

It is a large statement to make, as does the gentleman named, that the prosperity of New York State, as well as the Union at large, is almost entirely the result of the Erie Canal. No one denies that the Erie Canal has been an important factor in our development, and on some grounds its maintenance, as well as that of the other main arteries of our water routes, may be desirable, but the cause is not helped by draping it with too much beneficence. It was admittedly good, but it was not supreme.

Such remarkable progress as it has been our good fortune to enjoy is the resultant of such a host of elements that it is quite impossible to lay hold of one, even though it be among the chief, and with any propriety ascribe to it the merit of the whole. Nor, indeed, would the fact of its predominance in bringing about so desirable a result be a strong argument for its continuance, since the achievements of one generation are the stepping-stones and not the models for the next. The question would seem more aptly to turn on what the canal system is accomplishing for us now, and what it can do for us in the future.

The West is at present the theater of action from which we may draw many a just conclusion, and the fact that the canal is there seldom thought of, even in localities where a network of irrigating ditches is an essential feature, and could with comparative ease be made the basis for an extended series of water routes, is certainly not an indication of the interchangeability of railroad and canal. There are unmistakable signs abroad that the canal is something savoring more of the past than the future. Bands of steel seem a more fitting accompaniment of telegraph and telephone than do those sluggish, malarial water courses. It seldom happens that when two systems are in operation side by side, the one best adapted to our needs languishes, drops behind in the race, and is finally almost out of sight, while its less deserving rival expands with a growth that is almost magical. Yet such, we are told by the canal advocates, is the case between these two rival systems of transportation, even though the comparison is further emphasized by the fact that the present laggard had decidedly the best start. But there are many found who cannot agree to the statement, for there is a growing belief in the survival of the fittest in things mechanical as well as physical.

There is one argument brought forward in favor of the system, however, which may be deserving of attention. In these days of railroad coalitions, through freight pools and various forms of transportation combinations, it might be a wholesome check to have railroad directors remember that if their freight rates became too outrageous, recourse could be had to the canal for those more bulky goods whose indestructibility would survive a two-miles-an-hour rate of travel. To somewhat stretch a metaphor, the canal could assume in trade circles the airy position of the sword of Damocles, ever ready to descend upon the head of a too grasping railroad official.

The question of transportation is in the present day such a large one, and economical competition so close, that it is easy to reach the facts in the matter, without having to turn even to those unequivocal signs of growth and decay. The comparative cost between canal and railroad has more than once been discussed by such impartial bodies as the American Society of Civil Engineers, and their conclusions have certainly not been in favor of the former system. At the last convention of the Society, Mr. E. L. Corthell discussed the question at some length, and his arguments were conclusively on the side of the more progressive method. The inconvenience of the want of speed on a canal is one which it seems impossible to overcome, without an increased expenditure of power out of all proportion to the result. Experiments made on the traction power necessary to move canal boats at various speeds show that while the power necessary to move one ton is only 2½ pounds when the speed is 2½ miles an hour, it becomes 7 to 11 pounds at 4 miles, and reaches the enormous expenditure of 20 to 30 pounds when the speed attains the modest rate of 5 miles an hour. From this it follows that an economical speed must be only about 2 to 2½ miles. On the Erie Canal it is even less. The freight steamers make 40 miles in 24 hours. Professor Barlow's calculation, that the power required by canal boats varies as the *cube of the velocity*, is not in excess of the truth. The cause of this great resistance is due to the confined channel of a canal, where the "carrier" wave, which advances before the vessel, offers a continually opposing current to its progress, and is at the same time very destructive to the banks.

There are of course many classes of merchandise which, in spite of the want of speed, would still be carried by the canals, could they do so at any advantage over the railroads; but when it is shown, as Mr. Corthell has demonstrated, that in addition to all their other merits, railroads are the cheaper carrier of the two, there seems absolutely nothing to be said in favor of the canal. In England, in Canada, and in the United States, the experience has been the same. It is manifest that the canal cannot hold out against the railroad. Capital once expended in building a canal is devoted to the purpose forever, and if therefore we admit that it is lost, and in consequence omit all interest on the investment from our table of expense, there are localities where the canal can compete with the railway; but even under these circumstances the competition is fast narrowing, and with interest added to other expenditures, the railways will still be the winners. In the face of these facts, the wisdom of maintaining the system is even open to some doubt. The plan for its extension is certainly to be discouraged.

General Annenkoff proposes a sea canal from the Caspian into Michael's Bay, to render transshipment from deep into light draught vessels unnecessary. Such a work will greatly facilitate transport over the Caspian.

The Beginning of the Patent Office.

In the second volume of McMaster's "History of the People of the United States," recently reviewed in the SCIENTIFIC AMERICAN, we find the following interesting historical particulars concerning the American Patent Office:

"While one part of the community was expending its ingenuity in adding new words and phrases to our tongue, the ingenuity of another part was rapidly adding to that splendid series of inventions and discoveries which no American should contemplate without feelings of peculiar pride. The United States patent system had begun.

"The glory of it belongs to Jefferson. He inspired it, and long took so deep an interest in its workings that he may well be called the founder of the American Patent Office. The growth of it is marvelous. To one who wanders through the corridors of that magnificent building, and beholds the army of clerks and draughtsmen, and the hundreds of thousands of models there displayed, it seems scarcely to be believed that when 1800 came one man did all the clerical labor, and a dozen pigeon-holes held all the records of the office. For each of the patents which then existed a thousand have since been issued; nor does it seem too much to say that before 1900 shall have been reached this ratio will have been increased two-fold.

"The law of April 10, 1790, established the office, made the Secretary of Sate, the Secretary of War, and the Attorney-General a board of commissioners, and bade them examine the claims of inventors and grant patents to the deserving.

"So rigorously did the board construe the law that, in 1790, but three were issued. In 1791 the number rose to thirty-three. The next year it fell to eleven.

"In 1793, when Jefferson went out of office, twenty were sealed. The moment a claim came into the Department of State, Jefferson would summon Knox and Randolph. The three would meet, go over the application most critically, and scrutinize each point of the specification with the utmost care.

"If they threw out the claim, the decision was final.

"The inventor had no appeal.

"If they determined that a patent should issue, the paper was signed by the President and the Attorney-General, and the inventor paid down a small fee.

"For receiving and filing the petition, fifty cents; for filing specifications, ten cents the hundred words; for making out the patent, two dollars; for affixing the great seal, one dollar; for indorsing the day of delivery, twenty cents.

"It was a long document, for which the patentee was charged four dollars and a half.

"But the men whose clumsy machines and crude devices had been thrown out raised a great clamor.

"The power of the board was too great.

"It was outrageous that their decision should be final. There ought to be an appeal. Jefferson combated this, but the cry was heard. The law of 1790 was revised in 1793, and revised for the worse. The duty of granting patents was lodged with the Secretary of State alone. He was forbidden to reject any application not likely to be hurtful to the interests of the people, and the cost of patents was greatly increased. For forty-three years this law continued in force. Then the evils which grew up under it became so rank that Congress was again forced to interfere. Five months later, December 15, 1836, the Post Office building was burned to the ground.

"With it went the seven thousand models of the Patent Office, by far the noblest collection the world could then show. When the next fire occurred, forty-one years after, the Patent Office had obtained a building of its own, and the seven thousand models of 1836 had become two hundred thousand in 1877. It is deeply to be lamented that, of the many thousands destroyed in 1836, so few have ever been replaced. Not even a complete list of them can now be had. Yet, most happily, it is not impossible to form from the fragments of information gathered elsewhere some conception of the ingenuity of our countrymen.

"One had invented a grain cutter, a dock cleaner, and a threshing machine. No precise account of his work has come down to us. But we are told that with his reaper one man could cut five acres of wheat a day, and that his thresher could easily beat out as much grain in twelve hours as forty men. Another had devised and put up a water mill for roping and spinning combed wool and flax. A third had invented a candle machine, had made candles from the lees of the right whale, and had seen his work displayed and warmly praised in a long memoir by the President of the Agricultural Society of New York. A fourth had discovered a way of turning iron into steel. A fifth had incased himself in a strange apparatus, had surprised the fishermen of New London by going down in four fathoms of water, had walked upon the bottom, and had come up after being three minutes in the sea. A sixth took out a patent for a machine which has made his name famous ever since.

"The inventor was Whitney, and the machine he called a cotton gin."

Chrome Iron and Steel.

A boring tool of chrome steel, if properly proportioned, will stand to bore and turn cast iron that is too obdurate to yield to the persuasions of the best tempered and "highest" crucible steel cemented from bars of the best iron. A large fly wheel for a special purpose, with a narrow rim, and thirty-two feet in diameter, was found to be so hard on the face of the rim that it could not be turned. Much fuss was made to induce the obdurate rim to yield, but to no purpose. Grinding was attempted, and chipping, but the outer surface was like glass. Tools of chrome steel finally induced the iron to yield, and a costly casting was saved.

The chromate of iron, commonly called "chrome iron ore," is found in Maryland and in Pennsylvania. The bichromate of potash is made by heating chrome iron ore with one-fourth its weight of nitrate of potash (niter) and then digesting it with water. Chromeisen (chrome iron) is a compound of about three parts by weight of chromium and one of iron. It is hard enough to cut glass readily. Chrome steel has a larger proportion of iron. Both are used in the construction of burglar proof safes. Chrome steel may be made quite ductile and soft by using chromeisen instead of spiegeleisen in the Siemens steel process, when the resultant can be tempered to several grades of hardness within well defined limits. Chrome steel is useful for many jobs in the machine shop, and should be more generally employed.

Astronomical Notes.

Sun Spots.—The maximum of sun spot activity probably passed in the latter part of the year 1883. But solar physics are not regulated with line and plummet like terrestrial mathematics, and solar changes occur like dissolving views, where one phase glides into another by an imperceptible process. There are still spots on the sun's face, as any observer may see who has access to a small telescope. During a recent observation, made with a three inch refractor, we saw on one day six, and on another day nine of these little black patches on the shining orb. They were of all sizes from large pin heads to points, and some of them must have covered many thousand miles in area.

A remarkable event occurred on the 11th of June, notwithstanding the decrease of solar activity. Two spots were then visible to the naked eye. They were seen by observers in different parts of Europe, and were carefully watched during their continuance.

Those who study the changes on the solar disk will find, that year after year, with some exceptions, the spots will lessen in number and size until about 1889, when the sun will be nearly free from these unsightly blemishes. The spots will then slowly increase until about 1893, when the maximum is reached, and continues for two or three years. The sun spot period therefore embraces about eleven years. It is irregular and ill-defined, and the wisest scientist has thus far been unable to give a satisfactory reason for its occurrence.

Markings on Jupiter.—A famous red spot made its appearance on the planet Jupiter in 1878. It continued to be the observed of all observers for five years, when it gave signs of passing away.

Mr. Denning, of Bristol, who makes a specialty of watching the changes on the face of the giant of the system, announces that the spot has been growing much darker and more conspicuous during the last few months. He thinks it highly probable that the red spot may resume its former importance in the opposition of 1886. This indefatigable observer has been searching the archives for records of Jovian spots observed in former times. His efforts have been successful. In the records of 1843, a note book of the Rev. Mr. Key was found, containing a view of Jupiter with the dark belts admirably drawn, and between them, in stronger black color, a long oval spot, of precisely the same shape and size as the red spot that attracted so much attention. Mr. Denning also found that a large black spot was observed on Jupiter in 1843 by Mr. Dawes. Hence he is led to believe that the spot seen by two observers in 1843 is identical with that of 1878, and, if so, must represent some permanent feature on the planet.

Photographing the Stars.—The Messrs. Henry, of the Paris Observatory, have an apparatus specially prepared for photographing the heavenly bodies. M. Mouchez, the Director of the Observatory, has presented to the Paris Academy of Sciences a chart obtained by this method and executed by these skilled astronomers. It contains a small section of the Milky Way, and presents to view about 5,000 stars ranging from the sixth to the fifteenth magnitude.

There are 41,000 superficial degrees in the firmament. A representation of the whole surface completed in the same way would require 6,000 similar sections, forming 1,500 ecliptical charts. Gigantic as such a work appears, it is estimated that if it were undertaken by six or eight observatories, favorably situated in the two hemispheres, the work might be concluded in five or six years. Such a work would contain the photographs of 20,000,000 stars down to the fourteenth and fifteenth magnitudes. It would be a priceless contribution to the astronomy of the future; presenting an exact picture of the starry heavens at the close of the nineteenth century. The undertaking would rank as the greatest on astronomical records, and implies an amount of work sorely taxing human power. But there are active brains and willing hands among the astronomers of the day, whom difficulties will not deter. We have faith to believe that the century will not close before the starry firmament as it now exists is pictured by the wonder-working photograph, and made immortal for the use of the generations that succeed us.

Comet a, 1885.—The eighth month of the year is on the wane, and thus far but one comet has illustrated its annals. Professor Barnard, of Nashville, Tenn., was the winner of the celestial prize. He discovered on the evening of the 7th of July a small comet in Ophiuchus, its position being at that time in right ascension 17 h. 21 m., and in declination 4° 57′ south. The comet is described as being of the eleventh magnitude, having some central condensation, but no tail. It is moving south, and will soon be lost to view, even in the large telescopes. The small visitor has received great attention from observers without, however, any noteworthy results.

Sorghum Sugar in Kansas and New Jersey.

The Governor of Kansas, in his annual message, said: "There are now three sugar factories in the State, located at Sterling, Hutchinson, and Ottawa, and they produced last year 602,000 pounds of sugar. . . . This product was manufactured from 19,300 tons of sorghum cane." By an easy calculation, we find that the average yield of sugar, per ton, was 31 pounds, representing less than 1½ per cent of the cane worked.

The average for several hundred German beet sugar factories during 1884 was over 200 pounds sugar per ton, or a yield of 10 per cent on the total roots worked. Comments are unnecessary; these figures speak for themselves.

We have previously frequently called attention to the Rio Grande sugar factory of New Jersey. While several hundred thousand pounds of sorghum sugar have been annually extracted from the sorghum stalk, the average yield was only about 1½ per cent. A bounty was granted by the State on every pound of sugar made. The prospects for coming years are less encouraging than in the past. The bounty soon ends; and nearly all the hogs fed upon the refuse have died from some unfortunate disease. What is to be the ultimate utilization of this plant, upon the growing of which several hundred thousands of dollars have been spent, time alone can decide.

We have doubts as to the continuance of sorghum sugar manufacture after 1886. There might be here a nucleus for a beet sugar factory—in all cases the question is worthy of consideration.

We were much amused some time since, in reading an account of a speech of a would-be sorghum sugar manufacturer. He demands that all *beet sugar* entering this country be declared worthless, it containing a parasite of a most objectionable character. This absurd and wicked proposition is supposed to be a retaliation for the German attack on American pork.

The truth, however, is that hundreds of sorghum growers now commence to realize that the great Northern sugar producer of the future is the beet, and not the sorghum cane, as they have hitherto contended. In their moments of despair they wish to suppress the entire beet sugar importation, forgetting the distressing effect of the competition of the colonial cane-sugar.

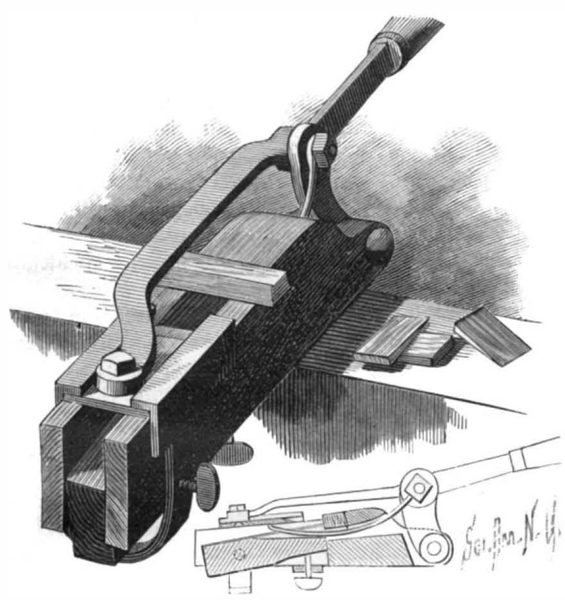
We, on the other hand, would prefer a high tariff and encouragement of the Southern sugar interest. If beet sugar enters our ports in preference to cane sugar, and is consumed by our people, it is one step toward convincing the community that beet sugar is a realizable fact, and that it will possibly prove a great savior of our nation.—*Sugar Beet.*

Temperature of the Earth.

The London *Times* says the German Government is having a deep shaft sunk near Schladebach, with the object especially of obtaining trustworthy data concerning the rate of increase of the earth's temperature toward the interior. At the beginning of this year the shaft had reached the depth of 1,392 meters, which is believed to be lowest yet reached. The temperature at successive stages is ascertained by a special thermometer, the principle of construction being that as the heat increases the mercury will expand so as to flow over the lip of an open tube. The difference of the overflows will give the rate of increase of the temperature. It has been ascertained that the temperature at the depth of 1,392 meters was 49 deg. Centigrade, or 120 deg. Fahrenheit. If the temperature increases regularly at this rate, the boiling point of water ought to be reached at a depth of 3,000 meters, or nearly two miles, and at 45 miles we should find the heat at which platinum melts. This would go to show that the earth's crust cannot be more than about one-ninetieth of its radius.

WEDGE CUTTER.

The engraving shows a simple contrivance for cutting wooden wedges rapidly and all of uniform size. A gauge block is placed between the prongs of a forked wooden or metal block, and adjusted in proper position for the wedges to be cut by means of screws, one of which passes through a cross piece on the bottom of the block, and the other through one shank of a stirrup extending under the forward end of the block. The thickness and taper of the wedge can thus be easily obtained by raising or lowering either end of the gauge. To the angle of the angle lever, which is pivoted to the rear end of the block, is pivoted one end of a curved bar whose forward end is secured to a cutting blade sliding in guides attached to the shanks of the block. Upon raising the handle, the piece of wood from which the wedge is to be cut may be placed upon the gauge and against a block held at the inner end of the prongs. The blade has its bottom slightly hollow ground at the cutting edge, and on its top it has a short steep bevel at the cutting end and a longer flat bevel behind. Upon pressing the handle down, the steep bevel splits a piece from the block of wood, which is then removed. The surface of the piece split from the block is then shaved off clean by the blade. The handle is then raised, whereby the blade is withdrawn and the wedge formed is thrown out at the back of the blade by a wire attached to the angle of the lever and passing through the main block and



JENKINS' LIGHTNING WEDGE CUTTER.

gauge, as shown in the sectional view. The connecting rod is curved so as not to interfere with placing the piece of wood upon the gauge.

This invention has been patented by Mr. James T. Jenkins, of Clements, Cal.

Influence of Magnetism upon the Embryo.

In the *Biologisches Centralblatt* we find a few interesting data relative to the influence of magnetism upon the embryo.

During the course of an artificial incubation Prof. Maggiorani submitted a certain number of hens' eggs to the influence of powerful magnets, taking care in doing so to keep at the same time an equal number of eggs away from all magnetic influence. The result was that, in the first group, four times more eggs were arrested in their development than in the second. After being hatched, three times more died out of the products of the first group than out of those of the second. Among the survivors, those of the second group all developed normally, while out of 114 of the first, 60 exhibited numerous imperfections or abnormal movements. Six chicks only of the same group reached maturity, and among these six two were cocks of remarkable size and appetite. Of the four hens, one never laid eggs, and the others laid very small ones, weighing about an ounce, and incapable of producing living beings.—*La Lumiere Electrique.*

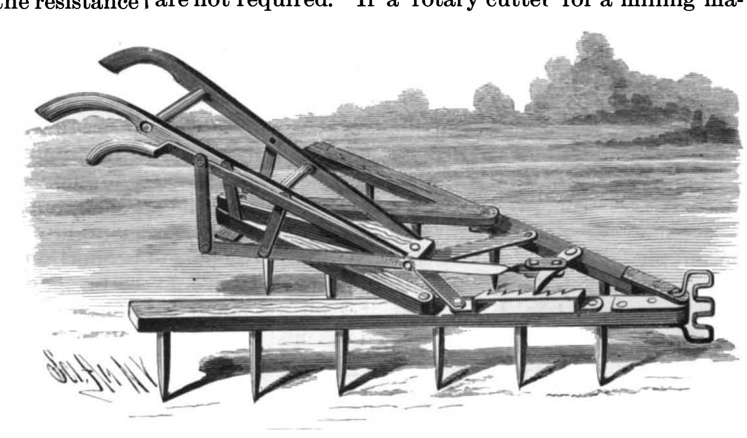
Mineral Wool.

In constructing fine houses builders now pretty generally use mineral wool between the floors and ceilings. This fibrous metallic substance is produced by sending a blast of air or steam through a jet of molten slag when it flows from the furnace. Having sustained the heat of fused iron, it is non-combustible and free from organic matter, so that it cannot rot or harbor any vermin. It is completety soundproof, and may be termed an absolute non-conductor of heat, for a layer of one inch thickness, says our informant, may fuse on one side while the other will remain cool. These properties, combined with its extreme lightness, have since its introduction a few years ago as a new building material made it a great favorite with architects and builders, and it is now largely used as a sound and fire proof filling between floor and partitions, and in attics to keep out heat and cold.

AN ADJUSTABLE HARROW.

A form of construction which permits the adjustment of harrows narrower or wider, as the work to be done may require, is shown in the accompanying illustration. The harrow has outer and inner toothed bars, with a center bar and its braces hinged to each other, so the harrow can be contracted and expanded. The hinged parts are supported against the resistance of the soil by a ratchet bar attached to one of the outer toothed bars and a pawl pivoted to the other outer toothed bar, the pawl being raised from the ratchet bar by a lever pivoted to the center bar of the harrow, to allow the harrow to be contracted by the resistance of the soil when the horse is started forward. The harrow can be expanded by raising its rear end by the handles, and then pushing the center bar forward with the foot until the desired width is obtained. In the case of large harrows the center bar affords a convenient place for a driver's seat, when the handles may be omitted if desired. This harrow can also be used as a cultivator, and can be quickly adjusted or changed without removing the hands from the handles.

This invention has been patented by Mr. W. Boatner, of Woodville, Miss.



BOATNER'S ADJUSTABLE HARROW.

MACHINE FOR CUTTING SCRUB, CANE, ETC.

The machine shown in the accompanying engraving is adapted for trimming hedges, and for cutting any kind of scrub, rushes, cane, etc., and it may also be used for cutting hard wood up to three inches in diameter and soft wood up to four inches. It is particularly applicable for mowing on rough ground, as it easily accommodates itself to the inequalities and is not liable to become clogged. The cutter is very simple in construction, and the knives, which form the weakest part, can be quickly replaced when damaged. The axle of the drive wheels, which are 4½ feet in diameter, revolves in bearings attached to a frame from whose forward part the tongue extends. To one end of the axle is secured a large beveled gear wheel that meshes with a beveled pinion attached to the forward end of a shaft revolving in bearings attached to the side bar of the frame. Upon the other or rear end of this shaft is a beveled gear wheel, meshing with a pinion upon a shaft revolving in bearings formed in the outwardly bent arms of a bar which is mounted, and turns upon the rear part of the first shaft. One arm of the bar has holes in it to receive bolts by which it is secured to the frame and thus held in position on the shaft. The cutter is mounted upon one end of the second shaft. When scrub, sugar cane, etc., are to be cut, the cutter is adjusted in a horizontal position, as shown in the engraving, the perforated arm of the bracket being bolted to the rear cross bars of the frame. When the machine is used as a hedge trimmer, the bracket is turned and bolted to the frame in such a position as to hold the cutter vertically. The machine is light draught, two horses being sufficient in light scrub.

This invention has been patented by Mr. William McLaughlin, P. O. Box 26, Auckland, New Zealand; the machines have been most successfully used in both New Zealand and Australia.

THE "FAUGH-A-BALLAGH" SCRUB CUTTER.

Casehardening Steel.

When the peculiar shape of a cast steel tool or other piece is such that the ordinary processes of hardening and drawing may distort and spring it out of shape, casehardening is employed instead. This, as practiced with prussiate of potash (ferrocyanide of potassium), hardens merely the surface or "skin" of the steel, and does not affect the interior. Cast iron and wrought iron articles are frequently so treated to give their surfaces a hardness impossible otherwise to obtain; but this treatment is restricted in its employment on steel, to articles and tools where grindings and resharpenings are not required. If a rotary cutter for a milling machine, or a planer or lathe cutter, was so treated it would require to be recasehardened every time it was ground, as the steel coating given by casehardening is only superficial. Yet for temporary purposes a casehardened tool will do effectual work; the writer once did a considerable job in screw threading with a large tap made of wrought iron and casehardened, no steel of the proper size being available.

A Fast Illustrated Paper Press.

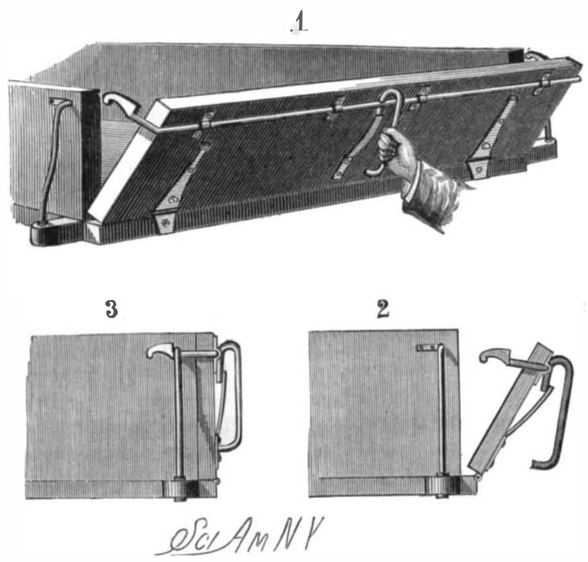
How to print large editions of finely illustrated newspapers quickly has been troubling the publishers of all such papers the world over. It is rather surprising that a Russian paper, issued in St. Petersburg, is the first to try a new press specially designed to do such work.

The press has been built by Denier, of Paris, and the idea is to have the printing of the illustrations done either before or after the reading matter, but during the same run of the sheet through the press. Thus the reading matter is made up in forms with blank spaces where the pictures go, while in the picture forms the reading space is left blank. There is an arrangement whereby the illustrations are inked by rollers separate from those used in inking the reading matter, so that fine ink can be used for the cuts and ordinary ink for the text. The making-ready is done as in all book presses.

The sheets are cut as they are printed, collected five at a time, and deposited on a receiving table without any tape touching the impression, and the copies when delivered in this manner are said to be as clean as when they leave the press.—*The Paper Mill.*

END GATE FASTENING.

The fastening for the end gates of wagon boxes shown in the annexed engraving is simple, strong, and durable, and can be very easily operated. Fig. 1 is a perspective view of the gate, which is shown open in Fig. 2 and closed in Fig. 3. Near the top of the outer surface of the gate is a rod held by clips; the ends of the rod are bent over on the sides of the box, and form beveled hooks adapted to catch on the usual side braces on the rear end of the box. At the middle of the rod is a downwardly projecting lug, against which the free end of a flat spring rests, its opposite end being secured to the gate. The spring presses the lug against the gate, thereby pressing the hooks upward. A handle arm projects downward from the rod, as shown in the drawings. When the gate is swung up against the end of the box, the hooks catch on the braces and hold the gate in place. To unlock the gate, the lower end of the handle is pulled outward, whereby the hooks are swung down and disengaged from the braces.

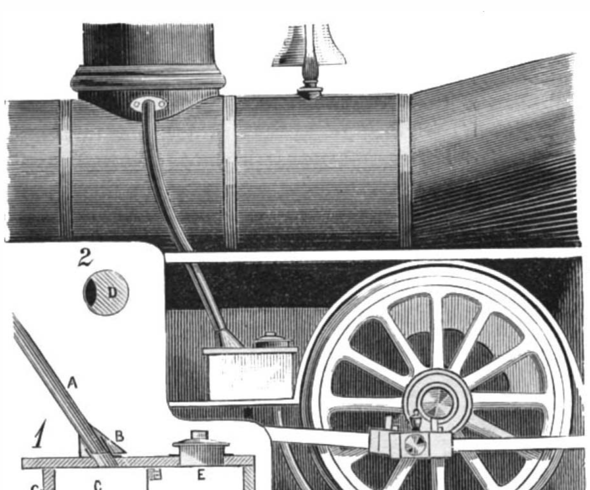


McKINNON'S END GATE FASTENING.

This invention has been patented by Mr. D. W. McKinnon, of North Sydney, Nova Scotia, Canada.

SAND FEEDER FOR LOCOMOTIVES.

A discharge pipe, A, leads from the sand box usually carried by a locomotive to a feed box secured to some convenient part of the engine in front of the drivers. The construction of the inlet opening is clearly shown in the sectional drawing, Fig. 1. In the bottom of the feed box is an outlet opening, D (Fig. 2 is a plan view of the opening), in which is held the end of an outlet pipe passing down in front of the driver and terminating near the rail. In the opening is inserted a plug, in one side of which is formed a groove of such size as to permit a stream of sand of the desired amount to flow through the outlet pipe. The amount of sand discharged can be regulated by using plugs with larger or smaller grooves. Access to the interior for changing or removing the plug is had through the opening, E, which is closed by a cover. Directly under the inlet opening is placed a drawer, C, formed of woven wire, with the exception of its outer end. The upper edge of the drawer is strengthened by bars, the side ones being grooved to slide on tongued bars attached to the sides of the box. The drawer is designed to retain any pebbles or refuse that would be liable to clog the groove in the plug.



CAMPFIELD'S SAND FEEDER FOR LOCOMOTIVES.

This invention has been patented by Mr. Hampton R. Campfield, of Susquehanna, Pa.

Influence of the Moisture upon Plants.

Prof. Hellriegel.—If a soil becomes so far desiccated as not to convey moisture to plants so rapidly as it is lost by evaporation, the energy of the movement of the sap within the plant and the tension of the organs are reduced. When this process has continued for some time, the elasticity of the cell walls sinks so far that it becomes outwardly manifest by the relaxation of the parts of the plant. Fading indicates not the beginning of the affection, but the commencement of the last stage. External fading does not begin until the plant has lost nearly half its moisture. Different plants do not behave quite alike with different degrees of moisture in the soil, but the differences are not very important. The production of plants is much reduced even by short periods of drought, and a subsequent abundant supply of water does not remove the injurious effects of a previous deficiency.—*Biedermann's Centralblatt.*

Repairing with Brass.

A special method of repairs with cast brass for large and valuable castings which cannot well be spared while new ones are procured, such as cylinder saddles broken through a steam connection or other projecting part, has been devised by Herr Haas, Government Master Mechanic at Berlin, and is illustrated in the *Organ.*

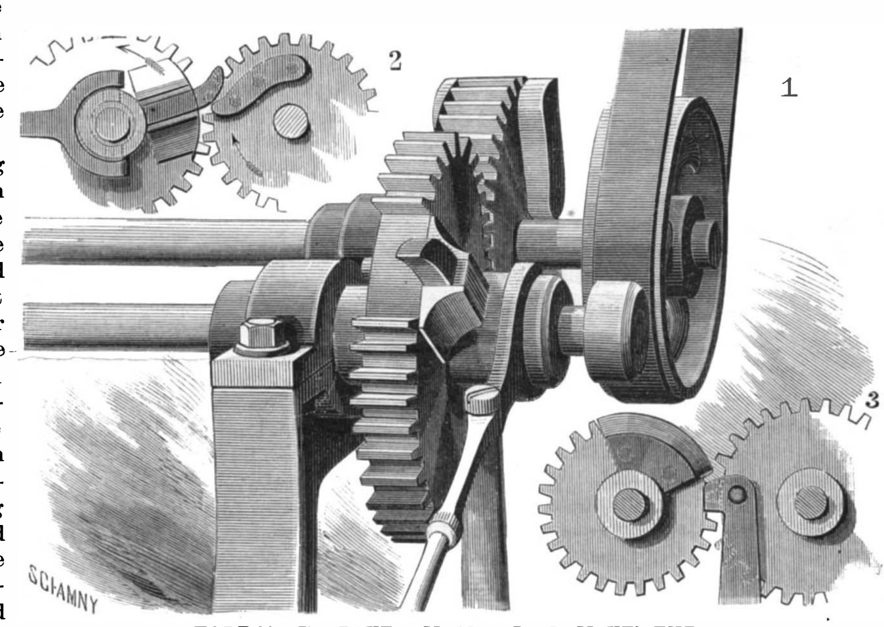
The process is as follows: The main casting is cut off inside the crack to a fairly uniform line. A model is then made by means of the portion cut off to fit over the end of the break and make the necessary junctions with the adjoining parts of the machine. The lower half of the mould flask is fitted around the broken end of the casting and well secured to it, and the joint is sealed with clay. The model is then set into the flask over the broken end, on which it, of course, should lap a certain amount, and the moulding is proceeded with. The upper half of the flask has, of course, a core fitting into the hollow of the broken end, if such there be. Before casting, the broken end is well warmed by a charcoal fire placed within, and the precaution is generally taken of boring several holes into the broken end around the part on which the patch takes hold, into which the fresh metal runs and forms lugs, making a firmer connection between the new and the old parts, though the chief reliance is on the shrinking of the new casting around the end of the old one. The heating of the old portion is done to avoid having this shrinking excessive and to prevent chilling.

Several repairs of this sort have been made by Herr Haas, with entire success, the parts still remaining in active use, though a considerable time has elapsed since the repairs were effected.

AN IMPROVED MECHANICAL MOVEMENT.

Mounted upon a suitable frame is a shaft carrying at one end a pulley and pinion, the latter meshing with a mutilated pinion on a shaft mounted on the same frame. To one side of the first pinion is fixed a cam (Fig. 2), which is so disposed that when required it may act on an arm or finger attached to a sleeve on the second shaft; this arm rotates with the shaft, and extends between two guide lugs projecting from the side of the pinion. By means of a lever, shown in Fig. 1, the sleeve may be moved longitudinally on the shaft so as to throw the finger in and out of gear with the cam. Secured to the opposite side of the first pinion is a wiper so placed as to act upon a spring bar (Fig. 3) attached to the frame, and provided with an opening to receive a pin projecting from the side of the mutilated pinion opposite the finger.

Upon revolving the driving shaft—the lever having been properly shifted to force the finger toward the pinion—the second shaft will be turned until the teeth of the first pinion reach the mutilated or untoothed portion of the second, when the latter will become stationary, thus imparting a "dwell" to the machinery in communication with the second shaft. During the stoppage, the spring arm engages with the stud and firmly holds the pinion. The first pinion continues its rotation, making the second turn, and as the finger is now in the path of rotation of the cam, it is struck by the latter. At the same time the wiper enters between the spring and pinion, and forces the former from the stud; and thus as the finger is pressed by the cam, the first pinion is rotated and the teeth of the two again mesh. The lever may be connected with other parts of a machine, in order to be automatically operated, or the finger may be fixed to the pinion, which will then be stopped and started as long as the machine is running.

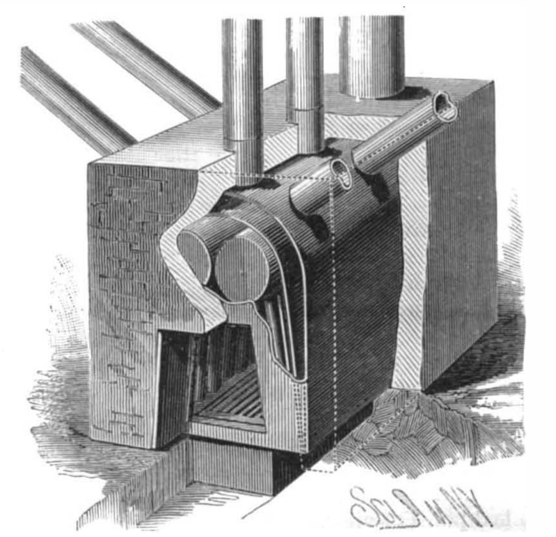


FARRA'S IMPROVED MECHANICAL MOVEMENT.

This movement can be applied to printing, punching, shearing, or stamping presses and other machines where a given time is required for feeding or other purposes. This invention has been patented by Mr. L. D. Farra, of 25 Mill Street, Germantown, Philadelphia, Pa. Particulars regarding American and foreign patents can be had from the inventor.

HOT AIR FURNACE.

Within the outer casing of the furnace, which is closed at its ends by walls, is a smaller one having one of its ends closed by the end wall of the main casing, and its other end closed by an inner wall. A hot air space is thus formed surrounding the two casings except at the ends having a common wall. The space inclosed by the inner casing forms the fire box of the furnace, and is connected with the chimney by a pipe. In the fire chamber, above the center, are placed horizontal air heating drums and a series of nearly vertical air inlet and heating pipes, which connect the drums with the external air through suitable openings made through the bottom. The drums communicate with the hot air space between the casings through openings made in the inner wall of the small casing. Pipes lead the heated air from the hot air space to distributing pipes extending to different parts of the building. Through the front wall, above the drums, is an opening closed by a cap, and through which the drums may be cleaned of any soot or ashes that may collect upon them. Below this opening is the furnace door. The grate bars are located between the series of air inlet pipes, which are inclined toward each other so as to stand partly over the grate at their uper ends, leaving considerable space between the outer surfaces of the pipes and the inner surfaces of the small casing; the heat from the fire is thus free to circulate around the pipes, and the flame is caused to spread and nearly encompass the drums. A larger and effective heating surface is furnished within the fire box without materially interfering with the draught; the space between the rear end walls of the casings also provides a large heating surface, so that all the available heat from the furnace is taken up by the air and distributed through the building.



OAKES & CAMP'S HOT AIR FURNACE.

This invention has been patented by Messrs. C. W. Oakes and E. B. Camp, of Billings, Montana.

AN artesian well in Kern County, Cal., has been completed which gives a flow of 1,575,000 gallons in twenty-four hours, and the water rises 11½ in. above the pipe.

A New Heliochromic Principle.

BY DR. H. W. VOGEL.

In the heliochromic processes of Ducos du Hauron or of Albert, three negatives are taken through violet glass, green glass, and orange glass respectively, and from each of these a collotype plate is made, and printed with a color complementary with that of the glass, the three colored prints being, as is well known, superimposed on the same surface. In this method, it should be noted, no very great progress has been made; but it may be mentioned that Ducos du Hauron used eosine collodion in taking all three negatives, no matter whether through red, green, or yellow glass.

Now eoside of silver is sensitive primarily for green, less for violet, and least of all for red, and is, therefore, the worst material when the medium is red glass; and one can hardly recognize it as the best when blue glass or violet glass is employed, as the special green sensitiveness is not utilized.

For exposures through blue glass, pure bromide should be the best material; while when red glass, cyanin gelatine plates are indicated.

Another fault of the Ducos method is the apparently arbitrary nature of the selection of printing colors. The rule that the negative exposed through glass of any given color should be printed in a complementary color is inexact, and allows wide latitude. One may say that the complementary color of red is green; but the kind of green is undetermined. As a matter of fact, the complementary color of a certain red is rather blue than green. The author proposes the following:

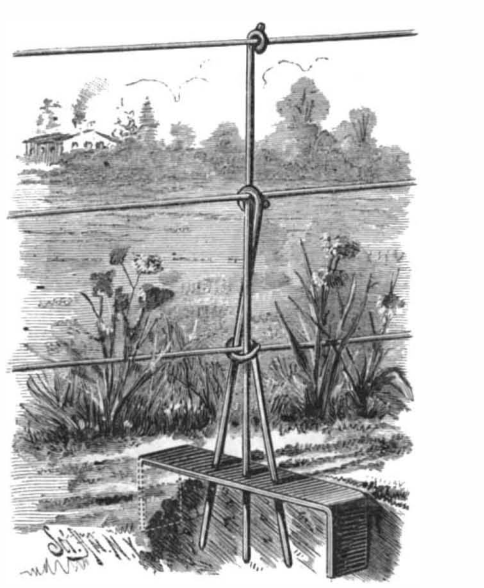
1. That instead of one single sensitizer being used, this should be varied according to the color of the glass used as a medium.
2. That the optical sensitizers shall themselves be used as the printing colors; or, if this be not practicable, that colors having the nearest spectroscopic relations to them be selected.

This last condition will be understood when one considers that the printing colors must reflect those rays which were not absorbed by the sensitive plate.

Up to now we have available a relatively small number of optical sensitizers; but chemical science is constantly bringing new coloring matters to the front, and many of these promise well. Many things which appear difficult to-day, either from an optical or chemico-technical point of view, may be mere bagatelles in ten years' time. Then will the color-sensitive process in photography, and the method of printing in several colors, become a real boon.—*Photo. News.*

IMPROVED FENCE POST FOR WIRE FENCES.

The accompanying illustration clearly shows the principle of a new form of fence post recently patented by Mr. William H. Gates, of Jesup, Iowa. Its base or ground anchor is a single plate of metal about two feet long and two inches wide, the ends so bent down at right angles as to form a top portion some twelve or fourteen inches long, which will rest on the surface when the bent ends are driven into the ground. Through holes in this base plate are forced down bracing and strengthening rods on either side of a higher rod forced down in the center, these side rods being looped at their upper ends to take in not only the central rod, but also any style of fence wire, metallic rib-

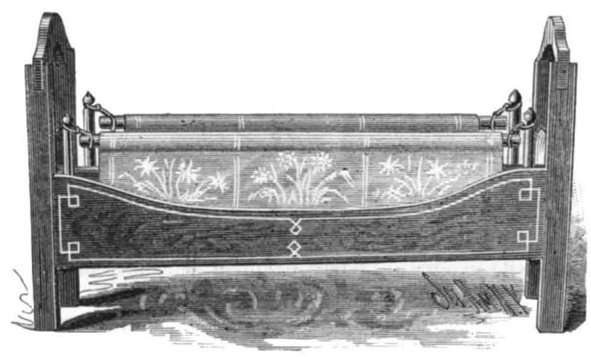


GATES' FENCE POST.

bon, or wire netting support. In building a fence after this plan, after the wires are placed in their several places at the tops of the post rods, the eyes and rods are to be turned or twisted a quarter round or more, to allow the wires to settle into the eyes and be bound fast by them. Light wooden rails may also be bound in the tops of the rods, and, as is obvious, no staples are required in a fence of this style of construction. When the ground is soft or marshy, or of a nature not to give a permanent hold, a pair of metal plates, crossed, is used for the base, with as many holes in them for supporting rods as are deemed necessary to hold the post and fence firmly.

A GUARD FOR BEDSTEADS.

A simple device for preventing children from falling out of bed, and one which is also applicable to cots and lounges, or to the berths of river and ocean steamers, is represented in the accompanying illustration. It consists of guards, each of which is formed of a strip of canvas, cloth, carpet, hammock mesh, or other flexible material, either plain or decorative, attached on its longer sides to bars that extend from the head board to the foot board. Little posts are supported by the side rails or by the head and foot boards, with knobs or catches on their upper ends, for holding the rings or loops of cords connected to the top bars of the guards, to hold them in their raised position. Lift the rings from the tops of the little posts and the guard comes down, and may be pressed under the mattress out of sight, when the posts may be lifted out of the castings; or the whole guard will roll to-



SHELLEY'S BEDSTEAD GUARD.

gether to occupy only a very small space, either in the side of the bed or in any convenient place.

This invention has been patented by Mrs. J. M. Shelley, No. 526 North Fourth Street, Keokuk, Iowa.

Economy of Heavy Locomotives.

In a communication from Mr. R. W. Bushnell, on "Cedar Rapids Shop Notes," valuable testimony is given as to the economy of using ten wheel instead of eight wheel locomotives in railroad operating. Up till two years ago, the Burlington, Cedar Rapids and Northern Railway was operated exclusively by eight wheel locomotives. The road is undulating, and most of the divisions have grades as steep as 60 feet to the mile, so that eight wheel locomotives weighing about thirty-five tons, with cylinders 17x24 inches, seldom took more than eighteen cars for a full train. As the business of the road was steadily increasing, it was decided two years ago to try ten wheel engines for freight traffic. The engines selected were about ten tons heavier than the eight wheelers, and they had one inch more diameter of cylinder, with sufficient boiler capacity to supply the increased demand for steam. These engines did their work with a trifling increase in expense of fuel and repairs, but they hauled from 20 to 35 per cent more cars than the eight wheelers could take over the grades. On an average, three of the large engines would take as many cars as four of the small ones. The saving of one train crew out of four represented an important reduction in operating expenses, but in many cases the saving of wages was of far less consequence than the acceleration of business that resulted from having 25 per cent fewer freight trains on the road. When a single track road is doing a heavy traffic that taxes every facility for moving cars, unavoidable delays are constantly occurring at the numerous meeting points. An improvement in the motive power that enables a given volume of business to be moved by fewer trains reduces the liability of this delay, and practically increases the capacity of the road. There is a limit to the length of trains, beyond which they may be so unwieldy as to cause constant danger from breaking in two, besides leading to the straining and wrenching of the cars from the shocks of starting and stopping, but that objection does not arise till more than thirty eight-wheel cars are on the train.

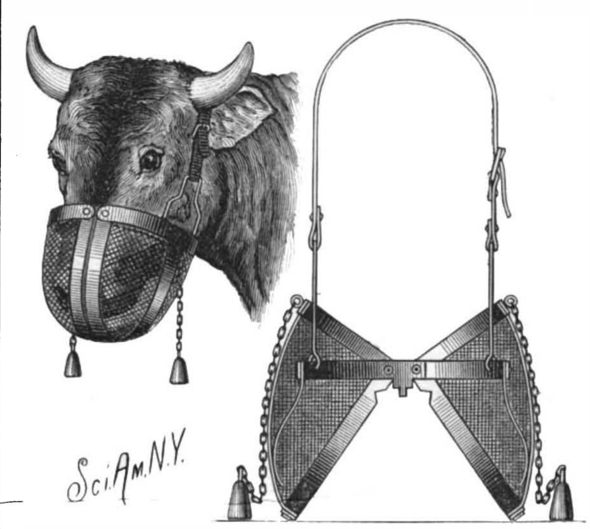
The objection generally raised on Western roads to increasing the weight of locomotives is the belief that they are hard upon the track and expensive to keep running. In most of the cases this objection rests on a fallacy. A locomotive with three or four pairs of drivers puts less weight per wheel on the rail than an ordinary eight wheel engine. There may be cases where the track and bridges are in such condition that increasing the weight of engines would be dangerous and expensive; but the railroads that are in this condition are happily becoming rare. The race of competition is now so exacting that the only means of carrying freight at a profit is by doing the work with the least possible expense. Using locomotives that will pull heavy trains is a direct move toward economical operating. The figures given by Mr. Bushnell do not, by any means, cover all the saving due to the use of ten wheel engines. He makes no account of the great wear to tires and track that results from the use of the average eight wheel engine, which in bad weather slips incessantly on every hard pull, when the drivers act like milling cutters on the head of the rail. In addition to destroying tires and rails, slipping tears up the fire, throwing away fuel, and it racks every part of the engine's mechanism, leading to the necessity for premature repairs. The proper way to avoid the expense resulting from the use of slippery engines is to employ locomotives with sufficient adhesion; and well designed engines with six or eight wheels coupled have been found most successful in meeting this requirement. If properly designed, a ten wheel engine is greatly superior to an eight wheel locomotive for handling freight trains, but we consider the ten wheeler a compromise inferior in every respect to the Mogul. What is urgently wanted in an engine for freight is sufficient adhesion, with good steaming capacity and ample cylinder power. It seems to us that every pound put upon a four wheeled truck, in addition to what would be necessary for a pony truck, is taking that much weight away from the drivers without any end being gained. When radial trucks came out first, there was more or less trouble with engines that were designed with improper length of radial bar, and that spread abroad the impression that the pony truck was a dangerous device. This old objection has made many master mechanics conservative about using the Mogul engine, even in cases where it would be infinitely superior to any other form of engine for doing their work economically.—*National Car-Builder.*

The Brazilian Navy.

Brazil possesses at the present time five ironclads. The Riachuelo was built in 1883 by Messrs. Samuda. She is 5,800 tons, built of steel, and has steel armor, 10 in. on the turret and 11 in. on the side. Her indicated force is 6,000 horse power, speed 16 knots, and she is armed with four Armstrong guns of 20 tons each, six of 5½ tons, and fifteen Nordenfelt machine guns. The Solimoes and Javany are of 3,600 tons each, and were launched in 1876. They are of iron, and have iron armor, 13 in. on the turrets and 12 in. on the side. Their speed is 12 knots, and they are each armed with four Whitworth guns of 25 tons each and four Nordenfelts. The remaining two ironclads are of 928 tons and 1,196 respectively, and have armor of 4 in. thickness. Brazil further owns a wooden ship plated with 4 in. armor, four small monitors for river service, and seven wooden cruisers. A steel cruiser of 4.000 tons, which is to steam 15½ knots, is at present being built for the Brazilian Government in England. Brazil has also seven wooden and five iron gunboats, and also five composite gunboats in course of construction, besides eight torpedo boats.

A MUZZLE FOR CATTLE.

Through the Southern States, and in Florida particularly, there is very little grass for cattle and horses during the fall, winter, and early spring, and farmers would then like to give their stock the advantage of the grass in their orange groves and orchards, but this is not admissible, because the cattle would injure the trees. The same facts apply at some seasons in many other sec-



PRIOLEAU'S MUZZLE FOR CATTLE.

tions of the country, and the accompanying illustration shows a recent invention for obviating the difficulty. The nature of the device will be readily understood from the engraving, one view showing the muzzle on the animal with its head up from the ground, while the other shows the position assumed by the muzzle when the animal bends its head down to feed. The muzzle is divided in two hinged parts, with weights operating to keep these parts closed when the animal's head is lifted, while springs throw the hinged parts open when the weights rest on the ground.

This invention has been patented by Mr. Philip Prioleau, Jr., of Melrose, Fla.

Correspondence.

Hints about Refrigerators.

To the Editor of the Scientific American:

I would suggest that the trouble in making ice keep in most refrigerators will be found mainly in the waste pipe. The cold air in the refrigerator is much heavier than the warm air outside, and runs out of the waste pipe on the same principle that warm air goes up a flue. To supply the air constantly running away, warm air is drawn into the refrigerator at every crevice. The waste pipe should have a suitable trap to prevent the cold air from flowing out. The common "U" trap is faulty, from its liability to get clogged with dirt. The end of the pipe should pass an inch or two into the top of a large dish. This fills with water and overflows, thus effectually preventing all escape of air.

"A large, nice refrigerator" is a delusion and a snare. The only refrigerator worth house room is a box with no opening except at the top, and a waste pipe provided with a trap. In such a box there is no movement of air; the heavy, cold air settles in it and stays like water in a dish. Such a box, protected with four or five inches of charcoal or sawdust hermetically sealed, will not require fifty pounds of ice a week. If any circulation, however slight, is permitted through the non-conducting material, moisture is condensed, and the packing becomes soggy and useless.

The patent refrigerators having ice in a box at the top and storage room below, can be made to do good service and economize ice only by having the side doors fitted with rubber strips and lever latches to hold them tight, so as to prevent the constant outflow of cold air and the resulting constant inflow of warm air at the top.

GEO. WING.

Faribault, Minnesota, July 11, 1885.

Cinder Concrete.

To the Editor of the Scientific American:

An article in last week's number of the SCIENTIFIC AMERICAN, on "Clinkers Concrete," suggests the following:

For more than 30 years I have used the glassy slag from our cupolas in making foundations for lathes, engines, stacks, or chimneys, and buildings. For foundations for buildings where the location requires piling, we put a log or several thicknesses of hemlock joist on top of the piling, and on top of this a concrete wall from 2 to 3 feet in depth, and in thickness according to the thickness of the walls of the building. For lathes, engines, etc., if on marsh or made land, we pile, or make a plank platform without piles, according to the character of the ground, the piles being cut off or the platform placed from 4 to 8 feet below the surface of the ground, as the case may be. On this platform we put concrete made of cinders, to the top of the ground; above t e ground we generally use hard brick.

These conretc foundations and walls are made by placing in the trench or hole layers of cinder about 6 inches thick, made tolerably level on top and rammed. Each layer is grouted separately with sand and cement, in proportions of two-thirds and one-third respectively; or if the ground is a dry one, or if not too wet, we grout with common lime mortar with a small portion of hydraulic cement added.

I have found the burned sand from the cores of railroad wheels, and the sand in which railroad wheels are pitted to cool, to make a hard and durable cement when mixed with the proper quantity of common lime. We use this sand for laying stone and brick in preference to that generally used by bricklayers; we also use it for concrete.

In grouting concrete foundations, care should be taken to fill all the interstices, making the grout thin so that it will run freely.

I have had occasion to remove a brick wall laid in mortar made of this burned sand and common lime, that was so strongly cemented together that the bricks would not separate at the joints, but split between the joints.

GEO. G. LOBDELL,
President Lobdell Car Wheel Co.

Wilmington, Del., July 24, 1885.

The Heat of Boiler Water.

To the Editor of the Scientific American:

In your issue of August 1, Mr. W. D. Evans has seen fit to criticise Mr. Williamson's article on steam engineering, but I should like to ask the attention of your readers to the fact that the paragraph called in question is nevertheless not incorrect.

Mr. Evans objects to the expression "requisite amount of heat," but I think that by re-reading the sentence in which it occurs, he will find it less indigestible.

The statement made in Mr. Williamson's article, that "one cubic inch of water, with the requisite amount of heat, and at normal pressure, flashes into sixteen hundred cubic inches of steam," is perfectly correct, but would cease to be so were either modifying clause omitted, for it is not customary for water to flash into steam without the agency of heat, nor would it occupy the volume named under more than ordinary atmospheric pressure. The illustration added, "as would be the case in the bursting of a steam boiler," detracts nothing from the truth of the general statement. It simply expresses the fact (and I think most readers so understood it) that the removal of the pressure by the bursting of the boiler realized the conditions recited: water which, before, though above the normal boiling point, remained as such, would, on being released from pressure, be instantly converted into steam, so far as the accumulated energy permitted, and would produce those destructive effects with which every engineer is so well acquainted.

The researches of Professor Bunsen into the cause of geyser action are a beautiful illustration of the case in point.

Mr. Williamson's further parenthetic statement that the expansion of gunpowder on explosion is no more than equal to that of water into steam is not less correct. It is stated, I take it, simply as an interesting fact emphasizing the power of heated water when allowed to flash into steam, and not with any idea of connecting or comparing it with boiler explosions. I am quite sure that it was not his intention to assert the equal destructibility of water and gunpowder, or to maintain that an exploding boiler might as well be filled with gunpowder as hot water, as might be inferred from the criticism. Nor can I agree with Mr. Evans that any expressions in the article give rise to such an intimation.

Under these circumstances, I do not think that Mr. Williamson's critic is justified in offering as the *raison d'etre* of his communication that he dislikes "to see statements which so much exaggerate the facts, or which cannot be verified by the accepted theories of heat and steam."

PORPHYRY DYKE.

Philadelphia, August 1, 1885.

Linseed Oil and Its Uses.

Linseed oil is generally prepared by cold or warm pressing of linseed. Its employment in the manufacture of oil paints is owing to its drying properties. When spread out in thin layers, it dries and forms a solid, varnish-like body.

Fresh linseed oil always contains watery and gummy bodies, from which it must be separated before being used. The simplest method for purifying and clarifying linseed oil consists in storing it for several months and then carefully drawing it off from the sediment. The coloration and oxidation of linseed oil is due to the absorption of oxygen from the air, and it is for this reason that the linseed oil should be stored in hermetically sealed vessels, if possible in the dark.

When linseed oil is to be used for paints, its drying properties must be improved; that is, it must be converted into a varnish. For this purpose 2½ parts of litharge are placed into an iron or copper boiler with 50 parts of old clarified linseed oil. The oil is then carefully heated to boiling. At the end of about one hour a dirty scum forms on the surface of the oil, which must be removed as it forms. Precautions must be taken to prevent the oil from boiling over. It is advisable to have a proper cover and wet cloths at hand for extinguishing the fire in case the oil should become overheated. On a large scale jacketed boilers heated by steam are used. After the oil has boiled 3·4 hours, it is allowed to cool and settle. At the end of 2 or 3 days, sometimes after 24 hours, the clear oil is drawn off. The linseed oil varnish obtained in this way has a pale wine color, is clear and transparent, and more viscous than the original oil. It does not froth when poured out, and dries to an almost colorless mass. Linseed oil varnish should be kept in bottles. It may be ground with various colors, and used for painting wood, iron, brick work, etc. Melted together with resins, especially with copal and amber, it may be used as a waterproof paint on wood, etc.

To make a white oil paint, this linseed oil varnish is generally ground with lead; and in case colored paints are to be prepared, ocher, Naples yellow, terra de Sienna, chrome red, vermilion, etc., are added. When wooden floors are to be painted, they should first be saturated with linseed oil. For this purpose the oil should not be used cold, but always warm, because the heated oil is more fluid, and penetrates the wood to a greater depth.

Oil putties generally consist of linseed oil, varnish, and litharge, or calcined chalk. This putty is gradually converted into a soap, which is perfectly insoluble in water. Its hardness may be increased by the addition of quartz sand or brick dust.

In painting, the finest purified and bleached linseed is often required. Such an oil may be prepared by treating the varnish, prepared as above, with a solution of sugar of lead. The sugar of lead solution is prepared by dissolving 1 part of sugar of lead in 16 parts of alcohol; 100 pounds of linseed oil are heated to 85 to 90 degrees, and then thoroughly mixed with 5 or 6 pounds of the alcoholic lead solution. The oil is then left at rest for 3 to 4 days, and the clear, bleached oil is drawn off from the sediment. The sediment may be freed from the gummy matter by filtration.—*H., in O., P. & D. Reporter.*

No Right to Pollute Wells.

An interesting point as to the right of one of two owners of a well having a common source of supply from underground water to restrain the neighboring owner from so dealing with his well as to cause the water which the other owner pumped out of his well to be polluted, has recently been decided by the Court of Appeals, in the case of Ballard *vs.* Tomlinson, all three judges agreeing to set aside the judgment of the court of first instance. The plaintiff drew his water from a well sunk to a depth of 222 feet into the London clay, and bricked around. From the bottom of the well a pipe was carried through the Thanet sand into the chalk to a depth of about 300 feet from the surface. From the sand and chalk, which were water bearing strata, the water found its way by natural pressure into the well, from which the plaintiff raised it by pumping. About 99 yards from the well the defendant had another well of similar construction, and going down to about the same depth in the sand and chalk, but the surface of the ground was about 10 feet higher than at the plaintiff's well. Both wells were supplied from the same subterranean water. The defendant having ceased to use his well, made a drain, by which sewage was discharged into it. The plaintiff complained that the sewage had polluted the water in his well; and he claimed an injunction to restrain the defendant from so using his well as to pollute the water in or coming into the plaintiff's well, and also claimed damages for pollution. It was argued for the plaintiff that, although there can be no property in underground water flowing in natural undefined channels, and, therefore, that a land owner may so deal with such water as to deprive his neighbor of it, yet he cannot so use his well as to prevent his neighbor from drawing pure water. It was also said that the defendant's well and pipe were artificial channels, so that he was responsible for the consequences of allowing sewage to flow into the well. For the defendant, it was argued that he had not polluted any water in which the plaintiff had any property, and that if the plaintiff chose to draw the water from the common supply, he must take it as he found it.

In giving judgment, the Master of the Rolls—Lord Justices Cotton and Lindley concurring—held that the defendant had polluted the common reservoir of water by collecting sewage in an artificial shaft, and that no one has at any time any property in water percolating below the surface of the soil, even while it is under his land; every one has a right to appropriate such water, and may prevent it from going on the land of others. One neighbor may actually cause the water of his neighbor to come upon his own land, and deprive him of it with impunity; every one has a right to appropriate the whole percolating water, since this is a common reservoir or source, in which no one has any property, but from which any one has a right to appropriate any quantity. As to the question whether any one of those who have that unlimited right of appropriation has a right to contaminate the common reservoir, or whether he is bound not to do anything which would prevent any of those persons obtaining the value of their right, the court held that, inasmuch as every one has a right to appropriate the common source, he has a right to appropriate it in a natural state, and no one has a right to contaminate the common source. As to the point that the pollution would not have been caused if the plaintiff had not used artificial means by pumping, and, therefore, that it must be taken to have been his act, that was not a true proposition. So long as a person does not use any means which are unlawful, as against his neighbors, however artificial those means may be, he has a right to use them. The question of natural and unnatural user only goes to this, that, although a defendant does contaminate the water which goes on his neighbor's land, yet, if that act is only what has been called the natural user of the land, and although by that act the neighbor is injured, the defendant is not liable, because, otherwise, he could not use his land at all. The question did not depend upon the persons being contiguous neighbors; it signified not how far the plaintiff was distant from the defendant if it was shown that the defendant contaminated the common source of water. Summarily, no one has any right in percolating water, which, as it comes from a common source, every one has a right to appropriate; but, equally, no one has a right to injure. The decision reversing the previous one of Mr. Justice Pearson is a highly satisfactory one.—*Brit. Med. Jour.*

Bridging Lake Champlain.

A contract for a great bridge across Lake Champlain, from North Hero to Alburg, has been awarded to the R. Hawkins Iron Works, Springfield, Mass., for a little less than $50,000. The structure will be the first iron bridge across Lake Champlain.

THE GREAT DREDGER OF THE PANAMA CANAL.

(*Continued from first page*).

same panel to the stern. The bars support the tower against the strain of the bucket ladder. Each side of the tower is braced by latticed channels united by horizontal and diagonal members, and converging toward the side of the boat. Two plate keelsons 36 inches deep extend from the rear of the foot of the tower to the foot of the derrick, as shown in Figs. 2 and 3. The derrick is 80 feet long, and is made up of latticed channels 12¼ inches, united in the same manner as the tower. Two bars 1⅜ by 4½ inches extend from the top of the derrick to the bottom of the upper panel of the tower. The ladder is made in two sections jointed together, the upper part being 73 feet 10 inches long and the total length 115⅜ feet. The ladder is made of 4 by 6 inch angles joined by a web 24 inches deep and ½ inch thick, and each section is stiffened by a truss upon the under side.

The links of steel chain carrying the buckets, which are made of five-eighth inch steel and have a capacity of one cubic meter, are 3 feet long and 1⅝ by 7 inches in section; to every alternate link is attached a bucket placed between two links. All parts of the chain are made interchangeable to facilitate repairs. At the top of the tower the chain passes over a square tumbler, mounted on a shaft 14 inches in diameter and 17 feet long, and having chilled cast iron corners bolted between flange heads, so that they may be easily replaced when worn out or damaged. The chain passes under and over a six-square idler on the lower end of the ladder.

The chain is operated by engines 16 by 24 inches. The driving pulley is 10 feet in diameter and 38 inches face; the belt extends to a smaller pulley mounted in the upper part of the frame, and connected by gearing with the tumbler shaft.

The ladder is raised and lowered by means of a chain attached to a bail near the end of the ladder, then passed over a pulley near the top of the derrick, then under a pulley on a bail pivoted to the end of the ladder by the same bolt that holds the idler, and then over a pulley at the extremity of the derrick, and finally to a drum operated by 8½ by 12 inch engines. At the center of the engine shaft is a worm meshing with a gear on the drum shaft, as shown in Fig. 2.

The buckets empty into a bell of an iron chute, 3 feet in diameter and 180 feet long, and supported as shown in Fig. 1. To aid the discharge of material, when necessary, two pumps, 10 by 14 by 14, discharge water into the chute.

The engines are all double, and are link motion. Steam is supplied by three boilers—locomotive pattern —6¼ feet in diameter and 23 feet long, and of 100 horse power each. Exhaust steam is conveyed to a surface condenser. All the machinery is operated from one room located on deck, just forward of the center of the boat.

These dredges are known as the endless chain.

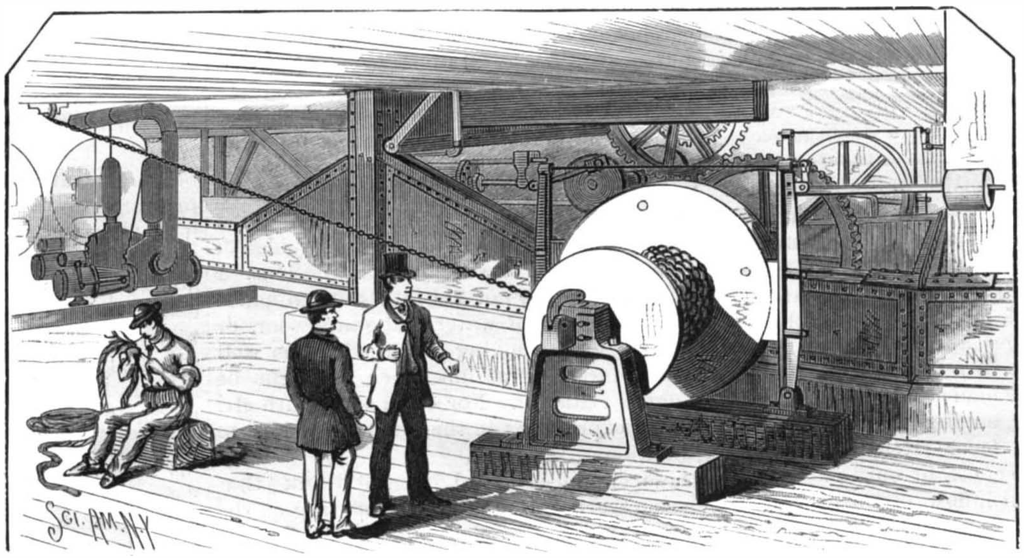


Fig. 3.—ENGINES AND DRUMS FOR OPERATING SPUDS.

The Pike's Peak Railway.

The Pike's Peak Railway, which is expected to be in operation this year, will be the most notable piece of track in the world. It will mount 2,000 feet higher than the Lima & Oroya Railway, in Peru. It is now in operation to a point over 12,000 feet above the sea level. The entire thirty miles of its length will be a succession of complicated curves and grades, with no piece of straight track longer than 300 feet. The maximum grade will be 316 feet to the mile, and the average grade 270 feet. The line will abound in curves from 500 to 1,000 feet long, in which the radius changes every chain.—*American Railway Journal.*

THE London *Times* states that an air balloon railway is about to be constructed on the Gaisberg, near Salzburg, a mountain of no great height, but offering a magnificent view over the environs of the town. The balloon, which will have grooved wheels on one side of its car, will ascend a perpendicular line of rails.

Congo Red.

The following methods for using Congo red are given by Prof. Egb. Hoyer in the *Wochenschr. d. Pol. Ver.:*

This coloring matter is specially adapted for cotton, linen, jute, etc. Cotton is dyed with two per cent dyestuff, without mordant, in a bath of boiling water, in which it is left for two hours, then washed and dried. After drying, the cotton is treated in a soap bath, containing 4 to 5 per cent soft soap, in which it is left until the shade is perfectly clear, the shade obtained being similar to a Turkey red, with a yellow shade.

Cotton yarn and piece goods are dyed the same as cotton, but are not dried before soaping, being soaped directly after washing. Some kinds of cotton get better dyed with the help of a mordant, and a solution of 1 per cent alum and 4 per cent borax can be added to the dye bath, the proceeding being the same as above.

The property possessed by this coloring matter of dyeing cotton in a water bath renders its application possible also for mixed goods, the wool being first dyed in any desired shade, and the cotton is then dyed with Congo red dissolved in water.

Another method is the following: Dissolve for 50 pounds cotton wool, 1 pound 8 ounces stannate of soda in the dye kettle; add 2 pounds potash soap, raise to boil, and scum the bath. Then add to the bath 1 pound Congo, and when this is well dissolved enter cotton; boil for two hours, and leave in the bath overnight. Pass, then, the cotton through the hydro-extractor. This same method gives very good results also on cotton yarn. It is better to dye with this coloring matter at boiling point, in order to increase the fastness of the shades against light.

Advertising in the London "Times."

Somebody has calculated that the advertisements in a recent Saturday issue of the London *Times* brought in about $11,000. This would make $66,000 a week, $264,000 a month, and $3,168,000 a year. The number consisted of 24 pages, and of these 14 were filled with advertisements. This is larger than the average number, and the total income for a year from the advertising is probably not more than three-fourths the above sum, or nearly $2,500,000 a year. What the expenses of the paper are, nobody but the proprietors and two or three others know. The highest estimates have, however, never exceeded $25,000 a week, or one-half the probable receipts.

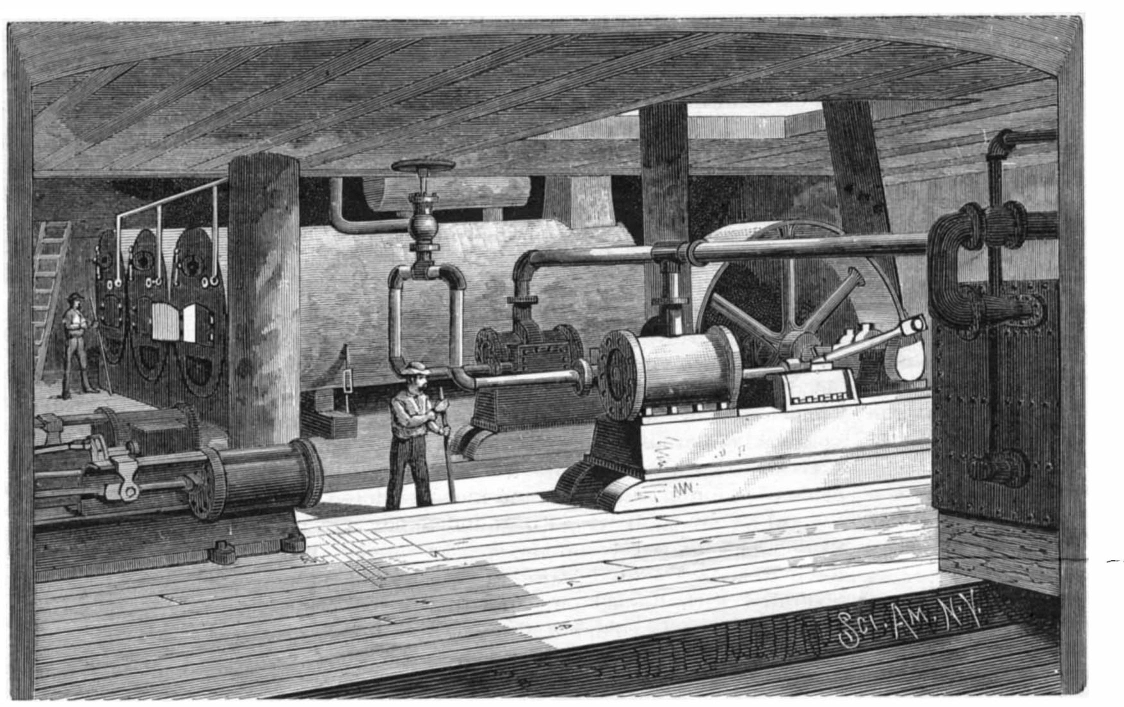


Fig. 4.—MAIN ENGINES, BOILERS, AND CONDENSER.

Heat Becoming Dark with Great Intensity.

Mr. W. Gadd, of Manchester, Eng., writes as follows to the *Journal of Gas Lighting:*

The account of M. Felix Lucas' experiments opens up the higher studies of heat and combustion, which have been the subject of inquiry by scientific investigators for many years past. I do not desire in any way to detract from the originality or merit of M. Lucas' work in saying that his conclusions are corroborated by earlier inquiry. As long ago as 1876 I was able to obtain from the burning of oil, under steam blast, first the white, then the gray, and lastly the invisible flame. And from a paper I read about that time, I append the following printed extract bearing on the subject:

"It has been calculated that if we increase this speed of vibration to about five millions per second, we are again made conscious of the same in the form of a faint heat emanating from the object, and that at about four hundred billions per second light commences—first a deep red, then (with further increase of speed) yellow, green, blue, and lastly violet. As these lights develop, however, with the speed, the heat at first felt fades away, and, like sound at a lower rate of motion, ceases to operate as such. If we follow the results of a further increase in speed, we find that when we reach about eight hundred billions per second all light ceases, just as if no motion whatever were in operation —in manner like unto sound and heat. It thus appears that we may consider the *modes* of motion as simply differences in speed, and that what we know as chemical action, electricity, and even life itself, are, on ultimate analysis, merely varying rates of the one all-pervading energy or motion of the particles of matter under consideration."

The difference in order of disappearance of light and heat is only apparent, as a consequence of being described from the mechanical standpoint, and is chiefly interesting as showing that the knowledge is not new, although the present contribution on the part of M. Lucas is extremely valuable. Personally, I do not lay any claim whatever in the matter, other than to a partial demonstration, in experiment, of a theory which had, previously to the date given, been repeatedly propounded.

My Boy, do You Smoke?

The United States Navy annually takes into its service a large number of apprentice boys, who are sent all over the world and taught to be thorough sailors. It has been the policy of the government since the war to educate the "blue jacket," upon the principle that the more intelligent a man is, the better sailor he is likely to become. There is no lack of candidates for these positions. Hundreds of boys apply, but many are rejected because they cannot pass the physical examination. Major Houston, one of the Marine Corps who is in charge of the Washington Navy Yard barracks, is the authority for the statement that one-fifth of all the boys examined are rejected on account of heart disease.

His first question to a boy who desires to enlist is: "Do you smoke?" The invariable response is, "No, sir," but the tell-tale discoloration of the fingers at once shows the truth. The surgeons say that cigarette smoking by boys produces heart disease, and that in ninety-nine cases out of a hundred the rejection of would-be apprentices on account of this defect comes from excessive use of the milder form of the weed. This is a remarkable statement, coming, as it does, from so high an authority and based upon the results of actual examinations going on day after day, and month after month. It should be a warning to parents that the deadly cigarette is sure to bring about incalculable injury to the young. A law passed restricting its use to the dudes would not, perhaps, bring popular disfavor, because it might reduce the number of these objects about our streets, but boys indulging in the cigarette ought to be treated to liberal doses of "rod in pickle" until the habit is thoroughly eradicated.

THE FRENCH DISPATCH TORPEDO BOAT LA BOMBE.

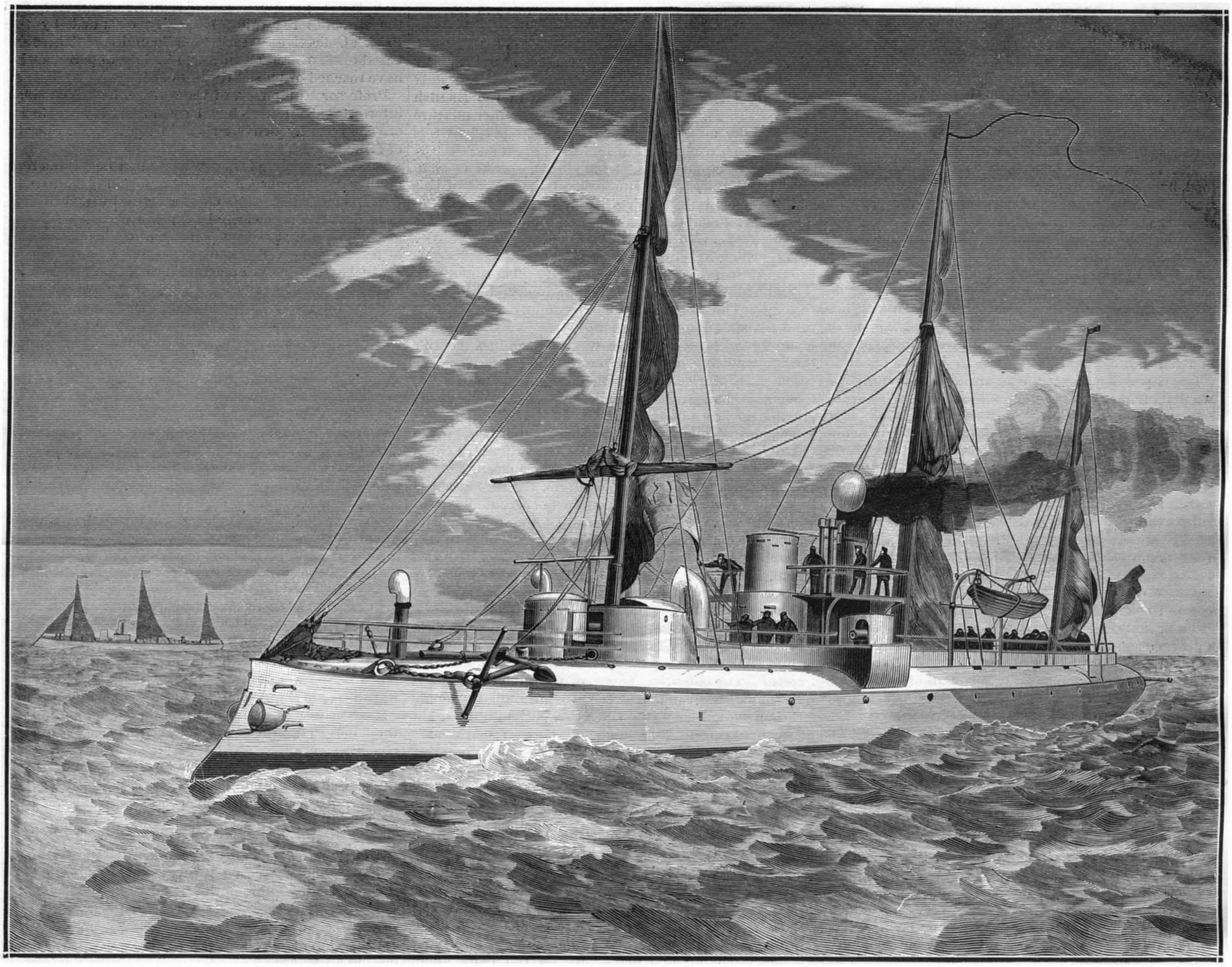
According to the new classification adopted by the French navy, the torpedo boats are divided into several classes, viz.:

1. The torpedo cruisers of from 1,240 to 1,260 tons.
2. The dispatch torpedo boats, of from 320 to 380 tons.
3. The torpedo boats for deep water, of 50 tons and upward.
4. The torpedo coasters, which are again divided into two classes, those of the first class being of 50 tons and those of the second class 25 tons.

Finally, in the fifth class may be included the vedette torpedo boats, of 25 tons, which, in spite of their slender build, or rather because of their slender build, can render great service for the defense of the coasts.

The annexed cut represents La Bombe, which has just been launched at Havre, and which belongs to the second class, that of the dispatch torpedo boats. It was built at Havre by the "Societe des Forges et Chantiers," which firm has just built, for the Ottoman Government, two torpedo boats which are really remarkable.

Eight torpedo boats, similar to La Bombe, are now included in the official list. They are: La Couleuvrine, La Dague, La Dragonne, La Fleche, La Lance, La Salve, and La Sainte-Barbe. But of the eight, only La Bombe has been completed. This vessel measures 196 feet 10 inches, from stem to stern, and draws 5 feet 10 inches of water. It is made entirely of steel, and care has been taken to make the hull as light as possible, and at the same time strong enough for navigation of the high seas. The dispatch boats of the Bombe type are furnished with two engines, each acting upon a screw, and developing 1,800 horse power. The speed attained is almost 18 knots. They have three masts, and are provided with all the latest improvements for handling torpedoes, with apparatus for electric lighting, etc.—*L'Illustration.*



THE FRENCH DISPATCH TORPEDO BOAT LA BOMBE.

The Panama Canal.

We learn that within a few months the first nine or ten miles of this canal will be opened to light draught vessels. This run will extend from Colon to above Gatun.

How Wood Paper is Made.

At Mapleton, Pa., there is a mill where paper is made from wood, and in this mill there is a machine resembling in appearance a large cheese box, about six feet in diameter, standing on its edge. In this cheese box there revolves, at an enormous speed, a strong iron disk, armed with a great number of sharp steel knives, which cuts up the wood into shavings similar to those made by a draw knife. While we were looking at this machine an attendant picked up a heavy stick of cord wood, which he placed in an inclined trough by the side of the machine, and shoved it into the same. In a twinkling the log had disappeared, and a second was sent after it, quickly followed by a third. Although it may seem incredible, that machine reduced those heavy 4-foot sticks to shavings at the rate of three a minute!

These shavings are carried off by a conveyer to the "boiling room," where they are boiled for several hours in caustic soda—"soda lye"—which combines with all the resinous matters in the wood, and reduces it to a mere fibrous pulp. This pulp is next run into the "washing machines," which are oval tubs about fifteen feet long and six or eight feet wide, having a longitudinal partition in the middle, extending nearly the entire length of the vat. In one of the compartments thus formed there is a "beater," composed of a number of steel blades with rounded edges, which revolve at a high rate of speed between stationary blades in the bed plate below. In the other compartment there is a "washer," which consists of an octahedral frame covered with very fine wire gauze, and inclosing a sort of water wheel. The water runs in the opposite direction to the beater, but very slowly, and the result is a constant current of the pulp up one side of the machine and down the other. A stream of water is constantly flowing into the machine, and the water in the washer is as constantly scooping it up and emptying it through its hollow shaft. The beater forces all the dirt and foreign matter out of the pulp, and the washer removes the dirty water, so that the fiber becomes thoroughly cleansed. It is now removed to another machine similar to the first, where it is bleached by means of chloride of lime and muriatic acid. The washer is dispensed with during the bleaching. After the bleaching comes another washing, to remove the chemicals from the fibers, and the pulp, thoroughly softened and mixed with water, is drawn off into storage tanks, whence it is pumped into the paper machines. At one end of the latter is a box into which the pulp is pumped from the tanks. This box has a fine horizontal slit, from which the pulp flows in a steady stream on to an endless wire gauze apron, about six feet wide, which is constantly running away from the box. The rolls over which this apron runs have an "end shake" similar to that of a grain separator. The apron runs over a copper "suction box" having numerous holes in the top, from which the air water are constantly being exhausted. The effect of the suction box is to remove most of the remaining water from the pulp, which by this time resembles a wet sheet of paper. The damp sheet is now taken up by a felt blanket and carried over steam heated drums. By this time the paper is strong and dry enough to support itself, so it leaves the felt and passes unaided between the highly polished calender rolls, which smooth it and give it a hard surface. It is now rolled up ready to be removed to the cutting machine, where revolving knives reduce it to sheets, which are piled, sorted, and counted ready for shipment.

If a fine paper is desired, the roll in place of being cut up into sheets is reground in a "rag engine" similar to the washing machines, still further washed and bleached and sent through another "Fourdrinier machine," whence it issues as pure white finished paper. The "size" which gives paper its glossy finish is introduced into the pulp while it is in the last washing machine. At the West Newton paper mills, rolls of paper four miles long are regularly made, and rolls nine miles long have been made from reground wood paper.—*Paper and Press.*

THE Bridgeport (Conn.) Hand Sewing Machine Co. is a new corporation now engaged in bringing out a novel and cheap sewing machine. It consists of a pair of handles, pivoted like scissors, but carrying a needle shuttle and feed motion, forming a complete sewing machine. By working the handles with the fingers the cloth is sewed with the lock stitch in a very effective manner. These sewing machines are to be supplied by the million at popular prices, say five dollars.

Clay Eating.

In many countries, certain clays have been used from time immemorial as a food product.

Clays are essentially formed of silica, alumina, and water in variable proportions, colored by metallic oxides, and presenting themselves in amorphous masses which are smooth and unctuous to the touch, and upon which the friction of the nail leaves a shining trace as upon soap. They adhere to the tongue, and form with water a fine, pliable paste that may be given all sorts of forms. Some samples of edible earth consist, as in the case of tripoli, of microscopic fossilized shells and innumerable fresh water infusoria.

How man came to have recourse to such food we do not know, but the same circumstances have led to like results in countries that are very remote from each other. "The practice of eating considerable quantities of clay," says the learned naturalist Guibourt, "as a necessary supplement to too insufficient a nourishment is almost universally diffused among the savage peoples of Africa, America, and Asia." The Ottomacs, a people of South America, regularly consume from a pound to a pound and a half of clay per day, which satisfies their hunger without injuring their health. Among the Indians of the banks of the Amazon, clay forms a part of the fare, even when other food is abundant. Edible earth is sold in the markets of Bolivia, and a kind which has an agreeable odor is much esteemed among the Peruvians. According to travelers, the negroes of Jamaica have recourse to clay only when there is a dearth of other food, but they eat it without repugnance. On the contrary, the negroes of Guinea, transported to America, seek an earth analogous to that which they have been accustomed to, and, not always finding it, have recourse to pipe clay.

In the kingdom of Siam the women and children are clay eaters. In Java, says Labillardiere, they make a sort of cake out of a ferruginous clay which the men eat when they wish to become lean, and which the women use during pregnancy. It is an object of commerce in Annam and Tonkin.

It is a question here, then, of a widespread habit, that we find in all latitudes, from the equator to the polar regions—in Guiana, New Caledonia, Siberia, and Terra del Fuego—and one that has been preserved among some of the descendants of the Portuguese navigators. "There are still women in Portugal," says Guibourt," who delight to eat the red Boucaros clay from which the alcavozzas are made;" and he adds: "I do not think that so widespread a custom has the effect merely of momentarily appeasing hunger, without a result serviceable to nutrition. It is probable, on the contrary, that the instinct of preservation has made known to these miserable peoples species of clays that contain a certain quantity of organic matter derived from vegetable detritus, and that this material contributes to sustain them in those months of the year during which a more efficient food fails them." This reasoning appears very plausible, and if the more moderate use of edible earth has been preserved during years of abundance, it is doubtless so as not to lose the tradition of it, and in order to remember a resource that may become valuable at a given moment.

The Indians of the Dutch colonies of Java and Sumatra submit an edible clay to a peculiar preparation. They reduce it to a paste with water, separate all foreign matter from it, and spread it out in thin layers, which they cut into small cakes and cook in a saucepan over a charcoal fire. Each of these little cakes, which is rolled up, looks like a piece of dry bark. The color is sometimes that of slate and sometimes brown. The clay is also sometimes formed into rudely modeled figures of men and animals. This singular food has a slightly aromatic flavor that offsets its earthy taste.—*Science et Nature.*

Treatment of Cholera.

Dr. Mankan G. Dadiraian, of New York, formerly of Constantinople, Turkey, gives the following in the *Medical Record:*

That most estimable gentleman, Dr. Cyrus Hamlin, who spent forty years in Constantinople, and who had a wide and interesting experience in different epidemics, says in his book: "If you prepare for it (cholera), it will not come. I think there is no disease which may be avoided with so much certainty. But providential circumstances, or the thoughtless indiscretions of some member of a household, may invite the attack, and the challenge will never be refused." The greatest danger lies in the contact with choleraic discharges. This danger is greater than that of contact with the patient himself. To avoid this danger the stools should be thoroughly disinfected, and the closets where they are emptied should receive a thorough charge of the disinfecting agent. The disinfectants that are always kept in the houses of Europeans residing in Alexandria are as follows: First, two parts of carbolic acid and one hundred parts of water; second, twenty parts of ferrous sulphate and one hundred parts of water; third, one part of chloride of lime and eight parts of water. Either one of these may be mixed with the dejecta in the proportion of one to ten, and greatly diluted with water for urinals and closets.

The treatment of cholera. Without entering into the pathology and symptomatology of the disease, herewith is given the most simple and practical method of treatment, which has yielded good results in Constantinople and Asia Minor. There are four stages of cholera, requiring each a more or less different treatment: (*a*) Choleraic diarrhœa; (*b*) true cholera, with rice water discharges; (*c*) collapse; (*d*) reaction.

(*a*) Choleraic diarrhœa. This is the most important stage to be taken into consideration. At the first appearance of this symptom, treatment should be begun. Many are careless about the matter, and forfeit their lives in consequence, for this is the time when treatment is most efficacious. Sometimes this stage lasts one or two days; again only two or three hours, and then the succeeding stages follow with fearful rapidity. The patient must remain at home, stop his regular eating and drinking, and take as follows:

R. Chloroform,
Laudanum.......................................aa ʒ ij.
Brandy...℥ iijss.
M. Sig.—One tablespoonful every two to three hours in water.

One dose will often stop the diarrhœa, but it is safer to continue the remedy in half doses until the next day. This is the method mostly used in the English army in India. In Turkey, however, another mixture is generally used—known as "Dr. Hamlin's," as this gentleman introduced it in 1848 with great success. It consists of equal parts of laudanum, spirits of camphor, and tincture of rhubarb. Thirty drops of this mixture may be given in a little water or on a lump of sugar. The diarrhœa is generally checked, and great relief is also given to the vomiting and colicky pains which are often present. The dosage may be doubled if necessary. This remedy also should be continued for a day or two in gradually diminishing dosage. The diet should be rice, soup, toasted bread, and fermented milk (matzoon).

(*b*) True cholera. Here we find cramps, colicky pains, vomiting, and diarrhœa. The stools may succeed each other at intervals of from ten minutes to several hours. In India calomel is used in this stage, in hourly doses of ten grains, till the stools present their normal color and odor. This remedy is not much used in Constantinople, where "Dr. Hamlin's No. 2 Mixture," as it is called, has worked charmingly. It consists of equal parts of laudanum, tincture of capsicum, tincture of ginger, and tincture of cardamom seeds. Dose thirty to forty drops in a little water, given after each movement. After the third dose both the diarrhœa and vomiting are usually stopped. In this stage sinapisms must be applied to the stomach, abdomen, calves, and feet. Diet: rice water, crust wafers, chamomile tea.

(*c*) Collapse. Here spirits are our only sheet anchor. Brandy or whisky may be given every half hour in tablespoonful doses. Sinapisms, hot bottles, etc., are useful. The condition is one of the greatest gravity, but by no means hopeless. Many are pulled through.

(*d*) Reaction. As soon as the patient rallies, the treatment must be carried on entirely on general principles. After reaction has fairly set in, great care must be taken to prevent a relapse or a typhoid condition, which may prove fatal.

Practical Work of the American Dredging Boats at Panama.

A friend in Colon writes as follows: The Nathan Appleton, of the American dredges, which has been at work for some six weeks past in the cut at Gatun for the deviation of the Chagres River, has shown what can be done in the way of canal cutting. This dredge is now removing and depositing on the bank about 3,000 meters per day of hard clay and marl, mixed in some places with coral rock. The Belgian dredge which had been at work previously was a source of annoyance on account of its almost daily breaking of machinery, and incapacity otherwise, the work being a matter of haste. She was about six months in removing as much as has been done by the Appleton, her capacity being but 450 meters per day against 3,000 of the American. In the case of the American dredge, the deposit is discharged directly on the embankment, whereas the Belgian delivers in a scow, and that in its turn is again emptied of its contents by being placed between a double hull dredge, or in American terms a catamaran. This dredge is also fitted with revolving buckets, as are the others, and then the labor of discharging through a pipe to the embankment commences.

The number of men employed upon each of the above is as large as upon the American. The latter has no tugs or scows, which are needed for the former, and one can but note the great difference of expense in running them, and doing a small amount of work, against the large amount done by the American, at a light running expense.

There is no doubt but that there will be plenty of places where the Belgian dredges will be made available, but in the present instance time is an object, as that part of the work is needed to be completed to allow the advancement of other work in the Gatun section.—*Panama Star.*

Old Age.

With every year the average duration of life is increased, and we have more old people on our hands. Naturally, the question becomes of increasing interest, How shall we secure a healthful old age, and how can we prolong in comfort this senility?

Some curious information regarding this subject, though more especially regarding what may be called "centenarianism," has been published by a gentleman of Syracuse, N. Y., who, we are informed, has collected the histories of 10,000 people that have passed the age of 100 years. According to this authority, the United States leads in centenarian longevity, while Connecticut is ahead among the States. As to sex, women; as to occupation, soldiers, sailors, and farmers are the longest lived. Among the professions, 100 ministers, 30 doctors, and 10 lawyers reached their centennial.

Of more practical and scientific character are the statistics regarding longevity obtained by the British Collective Investigation Committee. These are based upon over 500 returns, and relate to persons who have reached or passed the age of 80.

Professor Humphrey, of Cambridge, has given some interesting deductions based upon these returns in an oration recently delivered before the Medical Society of London.

The first requisite for longevity must be an inherent quality of endurance, a something which is inborn and perhaps inherited. It is noticeable that the phthisical taint does not necessarily lessen the capacity for longevity. Among 500 aged persons, phthisis appeared in fathers, mothers, brothers, or sisters of 82, that is, in about 17 per cent. In one case both father and mother were phthisical.

A second requisite for long life is freedom from exposure to casualties. It is on this ground, in part, that more women than men reach extreme age. Other reasons, however, are, perhaps, a greater natural vitality, since even in early life the mortality is less among females than males. It does not seem to be proved by the data collected that short and small men and women have any advantage over those who are taller and larger. The average height of old Englishmen is 5 feet 6 inches, that of women 5 feet 3 inches.

Professor Humphrey would limit quite sharply the changes which normally occur in old age. They are quantitative rather than qualitative. There is a diminution in material and force, with perhaps a slight increase in the oily matter of the tissues; all other changes are pathological.

Among the most marked of senile changes are those of the bones. These lose in weight, but not necessarily in size; indeed, they may even increase in size by a sub-periosteal ossification. The interior of the bones becomes softened and filled with marrow; the walls become thinned. The ends of the bones are particularly affected in this way, and hence the liability of the bones to fracture at these parts. The alveolar processes waste away, so that in men above eighty the number of teeth is only six, while in women it is but three. The cranium generally becomes thinner and lighter. In some cases, however, the skull walls are actually increased in density and thickness by the osseous deposits on the interior of the brain case.

Contrary to a generally received view, the cartilages of healthy old people do not calcify and harden, but remain elastic. They, however, undergo some atrophy, which accounts for the decrease in height.

In the same way Professor Humphrey believes that calcification of arteries is not a process normal or common in advanced age. Among 382 returns relating to the pulse, it was found incompressible in only 72. In 362 returns, the arteries were found knotty in only 40. We cannot, however, place very much dependence upon such data.

The rate of the heart beat in old age has been said by some physiologists to be increased, by others to be diminished. The Collective Investigation shows that there is not much change. From the age of 80 to 90 it averages 73–74 in men, 78–79 in women. The respirations are a little increased in frequency, especially in women. Urinary troubles are a well known source of discomfort and suffering among old people. They do not, however, necessarily attend the decline of life. Among 157 males from 80 to 85 years of age, only 6 had any disease of the prostate or bladder. In the next half decade, however, the proportion was greater.

In old people wounds are known either to heal rapidly or to slough. The reparative process is often as rapid as in the young.

Sir Henry Thompson, in a recent article on "Diet in Relation to Age," has called attention to the harm that comes from attempts to over-feed old people. They are injured, he truly says, by the solicitous relatives, who think that in feeding there is sure help for the waning strength. The old need a light diet to correspond with the lessened work and slower nutrition and waste of their tissues.—*Medical Record.*

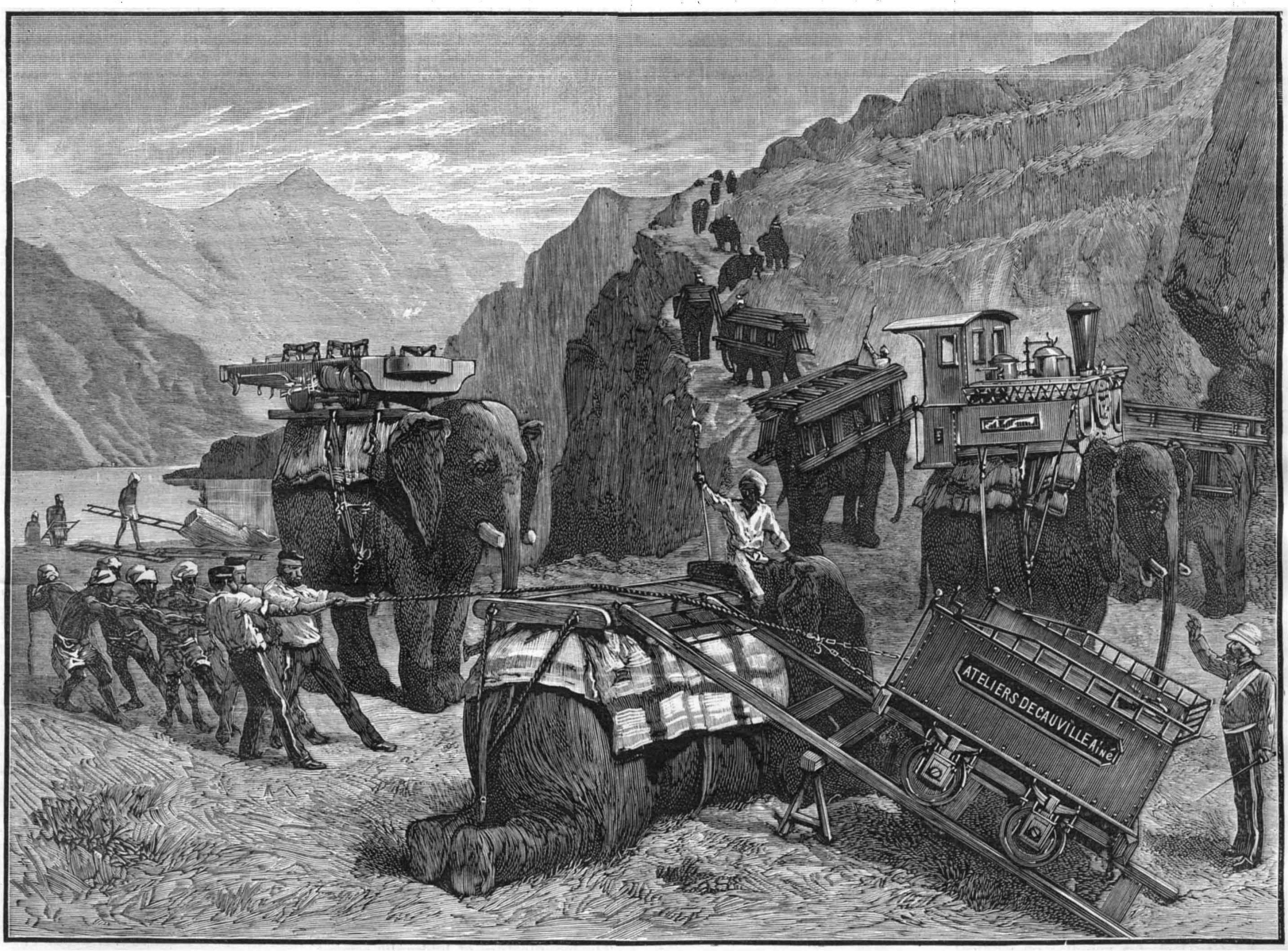
AN ENGLISH MILITARY RAILWAY.

The English army has succeeded in establishing a portable railway on several points of the Bolan Pass. This railroad is of the Decauville system, formed in sections of small steel rails, which can be put down or taken up very quickly. This ingenious railway—which has been used considerably for work on the Panama Canal and for the transportation of sugar cane in Australia and Java—has become the indispensable means of transport in all wars. It is at present being used in Tonquin and Madagascar by the French army, and is also being used on the Red Sea by the Italian army. When the Russian government commenced the war in Turkestan, in 1882, it bought one hundred versts, or about 66 miles, of the Decauville railroad, which Gen. Skobeleff used with great success for the transportation of potable water and for all the provisions for his army. This railroad was taken up as the army marched forward, and when the Russians advanced, recently, in Afghanistan, the little railway appeared at the advance posts, and was described to the English army by the officers who watched the operations of the Afghans. An order for a similar apparatus was given by the English government to M. Decauville, directions being given that the road should be of the same type as that furnished to the Russians. The object of this was, probably, that any sections of road which might be captured from the Russians during the war could be used by the English. In this last order there was one problem which was very difficult to solve: all the material had to be carried by elephants, and they wanted a locomotive. M. Decauville had the locomotive made in two parts, the larger of which weighed only 3,978 pounds, the greatest weight that an elephant can carry.

This episode of the Anglo-Russian conflict, illustrated in the annexed cut, is a great conquest for our national industry, for the works of M. Decauville are at Petit-Bourg, that is, in France, and only an hour from Paris. They cover about 20 acres on the bank of the Seine, and adjoin the P. L. M. The great hall is 525 feet long by 525 feet deep. The material is brought in at both ends (at one end the rails and steel for the road, and at the other end the sheet metal and iron for the cars), and the manufactured products are taken out at the middle, loaded in the cars of the P. L. M Co. In July, 1884, the works of Petit-Bourg attained their greatest development, with a thousand workmen, and 350 machines, which do the work of 3,000 men. Among others, there are four painting machines, which do the work of 60 painters. Three thousand cars and 93 miles of road are produced each month.

The rapid development of the Decauville works made it necessary to build a village for the accommodation of the workmen, or rather a little city, we should say, for there is even a theater here. The comfortable houses, surrounded by gardens, are rented to the workmen for 6, 8, 10, or 12 francs a month, a deduction being made in proportion to the number of children or the number of years that a tenant remains, so that after a certain time the tenant ceases to pay rent. If he becomes disabled by old age, the treasury of the society for mutual assistance pays him a small annuity. The bakery furnishes bread at a price below cost. The savings bank of the establishment pays interest to workmen who wish to save. The Committee of Rewards gives prizes to those who invent improvements in the machinery.

There is much more to be said about this philanthropic undertaking, but we hope to return to the subject at some future time.—*L'Illustration.*



ENGLISH MILITARY RAILWAY BUILDING IN INDIA.

The First Railroad in America.

In the course of a paper read before the Franklin Institute, bearing the title "Transportation Facilities of the Past and Present," Mr. Barnet Le Van corrects the commonly received statement that the Granite Railroad, built at Quincy, Mass., in 1827, by Gridley Bryant, for transporting stone for the Bunker Hill Monument from the granite quarries of Quincy, was the first railroad built in the United States. On this point he presents interesting testimony to prove that, far from being the first, the Granite Railroad was really only the fourth in order of precedence in the United States. We quote from that portion of the paper relating to the subject as follows:

"Railroads were also first introduced in Pennsylvania. In September, 1809, the first experimental track the United States was laid out by John Thomson (the father of John Edgar Thomson, who was afterward the President of the Pennsylvania Railroad Co.), Civil Engineer of Delaware County, Pa., and constructed under his direction by Somerville, a Scotch millwright, for Thomas Leiper, of Philadelphia. It was 180 feet in length, and graded 1½ inches to the yard. The gauge was 4 feet, and the sleepers 8 feet apart. The experiment with a loaded car was so successful that Leiper in the same year caused the first practical railroad in the United States to be constructed for the transportation of stone from his quarries on Crum Creek to his landing on Ridley Creek, in Delaware County, Pa., a distance of about 1 mile. It continued in use for 19 years. Some of the original foundations, consisting of rock in which holes were drilled and afterward plugged with wood to receive the spikes for holding the sleepers in place, may be seen to this day."

Silver-Aluminum Alloys.

Aluminum and silver make handsome white alloys, which, compared to those from pure aluminum, are much harder, in consequence of which they take a much higher polish, and at the same time they are preferable to the silver-copper alloys for the reason that they are unchangeable in air, and retain their white color. It has been proposed, therefore, no longer to alloy the world's coin with copper, but with aluminum, which makes them far more durable, and even after a long-continued use they retain their white color. Experiments on a vast scale were for this purpose instituted in European countries, but for some reason or other it appears that the silver-copper alloys were retained. According to the quantities of aluminum added, the alloys possess very varying physical characteristics. An alloy consisting of 100 parts aluminum and 5 parts silver differs but little from the pure aluminum, yet it is far harder and assumes a higher polish. An alloy consisting of 169 parts aluminum and 5 parts silver possesses a very remarkable degree of elasticity, and has therefore been recommended for the manufacture of balance springs for watches and dessert knives. An alloy composed of equal parts of aluminum and silver rivals bronze in hardness.

Heat Necessary for Electrical Conductivity.

A paper was recently read before the Paris Academy of Sciences on the electric conductibility of solid mercury and of pure metals at low temperatures, by MM. Cailletet and Bouty. From numerous experiments made with mercury, silver, tin, aluminum, magnesium, copper, iron, and platina, the authors conclude that the electric resistance of most pure metals decreases regularly when the temperature is lowered from 0 deg. to —123 deg., and that the coefficient of variation is apparently much the same for all. It seems probable that the resistance would become extremely slight at temperatures lower than —200 deg., although this point has not yet been practically tested.

ENGINEERING INVENTIONS.

A steam engine has been patented by Mr. Benjamin C. Waite, of Brooklyn, N. Y. This invention relates to engines having two pistons in one cylinder, their movement to be in opposite directions, and both connected to the same crank shaft, the object being greater simplicity of construction and economy of operation, whether the power in use is the full or only the partial capacity of the engine.

A car brake and starter has been patented by Mr. Johann H. Muller, of Gravesend, N. Y. A lever is pivoted at its center at each side of the car between the wheels, with slides on the ends of the lever with brake shoes pivoted thereto, in connection with which springs are so arranged as to be brought in tension by the action of the brake shoes in such manner that their power will be utilized in starting the car.

An electric railway signal has been patented by Mr. Albert G. Warren, of Mayesville, S. C. It consists of a construction for making a continuous circuit through a train, in combination with keys, a battery, and bell to enable the engineer to be signaled by the conductor from any part of the train, and to automatically transmit a signal to the conductor should the train break.

A marine engine governor has been patented by Mr. Aspinwall Fuller, of New York city. It is made in two parts, connected by a pivoting bolt, a clamping bolt, and a slotted quadrant, whereby the governor can be readily adjusted to operate when the vessel is loaded more heavily at one end than at the other, the invention being an improvement on a former patented invention of the same inventor.

A locomotive engine has been patented by Mr. James A. Longridge, of Westminster, England. Where the weight of the boiler is distributed on adjacent bogie frames by a balance beam, the point of support on one end of the balance beam is made as a ball and socket or universal joint, with other novel features, to facilitate the passage of the engine round sharp curves, and to avoid undue strains by changes of gradient or inequalities in rails.

AGRICULTURAL INVENTIONS.

A plow has been patented by Mr. Chas. D. Adams, of Geneva, Ga. Combined with the beam and its curved foot bars is a curved bar pivoted to the clip and having an arm and a brace bolted to the foot bars of the shovels, making a plow which can be easily adjusted for one or two horses, or as a cultivator, and its draught easily arranged.

MISCELLANEOUS INVENTIONS.

A scissors sharpener has been patented by Mr. James W. Hilton, of New York city. It consists of a longitudinally grooved block with beveled ends and having angular grooves, with a triangular fill having one wide and two narrow sides and fitting in the grooves of the block.

A hand strap for cars has been patented by Mr. James McManus, of New York city. It is made with the bend of its hand loop rounded and stiffened by a rigid rod having its ends bent upward, whereby the hand loop will be kept open and in proper shape to be conveniently grasped.

A pneumatic tool has been patented by Mr. James S. McCoy, of Brooklyn, N. Y. It is for working in stone and other purposes, and a current of air or steam forced into the tool causes a piston or striker to deliver rapid blows upon a rod or bar to the outer end of which the cutting point is attached.

A chair commode has been patented by Mr. Barney Rubenstein, of East Saginaw, Mich. This invention provides a light and easily moved chair for especial convenience in the sick room, calculated to prevent the escape of foul air.

A churn has been patented by Mr. James M. Champe, of Litchfield, Ill. The dasher consists of a cone with flange, perforated with a series of holes, a rod passing through the lid from the cone for working the dasher, when the milk passing back and forth through the holes is violently agitated, making butter in a short time.

A safety lock for spindles on jennies has been patented by Mr. Michael Furst, of Brooklyn, N. Y. This invention covers a novel construction and arrangement of parts for locking the spindles in such manner that the machine cannot be started until the spindle is in its proper place, thus obviating a common cause of accidents.

A calculator has been patented by Messrs. William B. Kennedy and Watson M. Nesbit, of Silver Reef, Utah Ter. A rotating disk is so combined with a numbered dial, a slate being also attached to the device, as to make a convenient mechanical calculator for use in teaching the fundamental rules of arithmetic to children.

A traveling emery wheel for card grinders has been patented by Mr. Joseph H. Loudon, of Westerly, R. I. It is a grinding wheel so mounted on a shaft as to turn and slide longitudinally thereon, and having an adjustable hub to take up the wear, the wheel being capable of nice adjustment and fit on the shaft without impeding its longitudinal movement.

A wagon brake has been patented by Mr. Adam M. Garman, of Sinking Creek, Va. Bent rods are pivoted to the axle, with hooks at their ends to bear upon or hug the wheel tires, and there is a rod operating chain looped through a ring or aperture of an upright on the axle, the device being applicable for locking the wheels of all vehicles running on wheels.

A spring motor has been patented by Mr. William H. Ostrander, of Newburg, N. Y. The device combines several springs and levers, which can be used separately or together according as more or less power is required, making a construction convenient for use to drive coffee and spice mills, sewing machines, and other light machinery.

An advertising medium has been patented by Mr. William C. Rogers, of New York city. Combined with a plaque having advertisements on its face, a clock is held in the middle of the plaque, a wire held on the clock casing back of the plaque forming legs for supporting the device, and the advertisements surrounding the dial.

A bran duster has been patented by Mr. Joseph W. Wilson, of Brookville, Kan. This invention covers a special construction and arrangement for more effectively rubbing the flour off the bran as the latter is passing down through the machine, the invention being an improvement on a former patented invention of the same inventor.

A scraper attachment for removing calcimine and the like from ceilings has been patented by Mr. Himan C. Dexter, of New York city. Combined with a stick is an inverted umbrella-like receptacle which can be held directly below the part of the ceiling being scraped, so that the scrapings must drop therein and will not soil the floor.

A padlock has been patented by Mr. Samuel McCarter, of Lancaster, Pa. The invention covers particular constructions and combinations of parts intended to make a simple and cheap lock, with parts which may be interchangeably assembled to produce finished locks which can be opened only by special keys.

A machine for covering, measuring, and cutting off strips has been patented by Mr. William Croal, of Brooklyn, N. Y. This invention consists in the combination, with a cutter, of devices for covering strips, rods, or wires, and a rotary feeding device, both operated from the same shaft, the machine being adjustable to cut the pieces any desired length.

A belt fastener has been patented by Mr. George W. Southwick, of Stamford, Conn. It consists of a plate with two or more teeth having longitudinal ribs on one or more of their faces, the ribs projecting beyond the upper edge of the teeth, so the belt does not need to act as a fulcrum as in other teeth, and its grain or fiber is not destroyed by clinching the ribs.

A swing has been patented by Mr. John T. Dees, of Goldsborough, N. C. The swing frame has segmental tracks, and the swinging car has rollers on its bottom, there being a rocking elbow lever connected with the wires or ropes by which the car is suspended, making a very safe swing, which can be easily operated and quickly stopped.

A device for opening doors has been patented by Mr. Samuel H. Law, of Brooklyn, N. Y. The push bolt has a pivoted link, and there is a crank arm, operating wire and spring, whereby the catch bolt of a door can be pushed back and the door unfastened by operating the wire, making a device easily operated and not liable to get out of repair.

A quilting support for sewing machines has been patented by Mr. Joseph A. Coppock, of Norwood, Ga. A frame is arranged to hold a sewing machine and pivoted to a suitable stand or support, so that a quilt stretched upon a frame may be passed through the arms of the sewing machine in position for stitching.

A wheel harrow has been patented by Mr. Thomas B. Fagan, of Van Wert, O. To the axle bar is pivoted a lever, the rear end of which is connected by links with tooth frames, the forward end being arranged in position to be engaged by the driver's foot, so that it may, when depressed, be held by a latch suitably arranged to be turned over it, with various other novel features.

A lathe for wood turning and making polygonal forms is the subject of two patents issued to Messrs. De Witt C. and Spencer E. Smith, of St. Paul, Minn. The inventions cover special constructions of lathes for making many sided objects, such as stair newels, piano legs, etc., being easily adjustable to receive timbers of different sizes, quickly clamp them, and readily remove them after the work is done.

A vest protector has been patented by Mr. Thomas S. Beals, of Detroit, Mich. This a novel attachment to protect the vest from wear or from being soiled, consisting of cloth or other fabric, either of the same material as the vest or otherwise, cut generally in the form of a strip to extend up and down the front, or over the most exposed parts, and which can be readily attached and removed.

A carbon cutting machine has been patented Mr. Mathew Egan, of Cleveland, O. This invention covers a construction by which the carbons are simultaneously separated from one another, and have all of the web by which they were joined together completely removed, also a mechanism by which the carbons are guided and carried forward while being acted on by the separating mechanism.

A painter's scaffold has been patented by Mr. William T. Howes, of White Heath, Ill. It consists of a frame with a seat, and having a pivoted pulley block, with clamps, pulleys, and ropes, and levers attached to the pulley block for fastening the ropes which hold the frame, so the operator can easily raise or lower himself to any place on the side of a house to which the device is attached.

A music leaf turner has been patented by Mr. Thomas H. Hathaway, of New Bedford, Mass. The music rack is supported by a standard with a suitable base, in connection with which is a foot lever whereby the frame is swung from the right to left hand side of the rack or desk, metal clips on the uppermost leaves being held by magnets so as to properly hold and release the leaves.

A steam boiler has been patented by Mr. Benjamin F. Wright, of Oneida, Kan. This invention covers an improvement on a former patented invention of the same inventor, whereby the gases, smoke, and heated air are driven directly through the water without the aid of flues, to prevent loss of heat, promote the rapid generation of steam, and obviate the escape of sparks.

A creaming can has been patented by Mr. George W. Millner, of Charlottetown, Prince Edward Island, Canada. Combined with a can is an arrangement by which a tube may be held in position therein, with its upper end above the surface of the milk, and when the cream has formed the tube may be depressed below the cream, and the latter withdrawn without affecting the milk.

A pipe system having auxiliary leakage conduit has been patented by Mr. Conrad Lutomski, of Pittsburg, Pa. It is more especially designed for natural gas and oils, and combined with the main pipe joints are casings with chambers which receive the leakage, and an auxiliary pipe to carry off the leakage to a point of discharge, the joint casings also having a tendency to stiffen and strengthen the joints of the pipe.

An apparatus for burning and preparing plant beds has been patented by Mr. James H. Horner, of Oxford, N. C. It consists of a furnace with a flue laterally extended therefrom which may be rested flat upon the ground, the flue being bottomless, so the heat will be directed in close contact with the ground surface, to destroy insect life, weeds, etc., near the surface, and thoroughly pulverize the soil.

A stove has been patented by Mr. Alexander T. Young, of East China, St. Clair County, Mich. Combined with the magazine of the stove is a ring held to move vertically therein, and downwardly projecting prongs forming a basket to hold the coals, to be opened and closed by raising and lowering the ring and prongs, with other novel features, whereby the quantity of coal to be fed to the fire can be easily regulated.

An angle indicator has been patented by Mr. Charles Schofield, of Chicago, Ill. It is a weighted or balanced pointer, with a graduated disk for getting a plumb, level, or any angle, without adjusting; the weights hang on inside of the cup, back of dial, or disk, and it can be placed in a spirit level, straight edge, or any other instrument, the weights being so adjusted in the device as to prevent all vibration of the counter.

A brick press has been patented by Mr. Hiram Lupher, of Tullahoma, Tenn. It is a simple duplex contrivance of moulds, clay feeders, pressing rams, and dischargers, to be operated by a pendulum lever so as to alternately press the bricks in one mould while discharging them from the other, a brick being pressed and another being discharged at each swing of the lever to which the power is applied.

A gate has been patented by Mr. Geo. A. Barlow, of Hamilton, Mo. An angle lever is pivoted on the swinging end of the gate, a bar connecting the lever with a hanger, with a rod pivoted to the hanger and having at its free end an eye forming part of the top hinge, with a latch bar secured to the elbow lever, so the gate can easily be raised at its free end to clear snow or other obstructions on the ground.

A machine for separating warp yarn chains has been patented by Mr. Andrew Mungall, of Manchester, N. H. It consists of a reciprocating comb or heck, with one or more drawing and shaking rollers and delivering rollers arranged for drawing the chains from boxes in which the yarns are brought to the machine or directly from the machinery of the dyeing, washing, and bleaching apparatus, separating the single chains and laying them in separate boxes or receptacles.

A cartridge shell extractor for fire arms has been patented by Mr. Frank Rushton, of Provo City, Utah Ter. A lever is pivoted on a cross pin in the shell chamber, and has at its end on each side a curved shoulder, against which the shoulders of extracting jaws rest, the latter mounted to turn on the cross pin, and arranged at the sides of the breech in such way that the shell cannot bind, and the extractors are not apt to break.

A well-pipe closing clamp has been patented by Mr. Habbe L. Aden, Jr., of Rising City, Neb. Combined with two grooved blocks hinged together a shaft is held to turn in the free end of one block, a chain or cord being secured to the rod and the free end of the other block, making a device for closing the holes in well tubes that are provided to let the water flow out of the upper part of the pipe, and prevent freezing.

An inkstand has been patented by Mr. Frank B. Woodhouse, of Utica, N. Y. An ink well is supported on a base, and an elbow lever pivoted to standards connected by one arm with the cover of the ink well, and so arranged that by a rest of the hand holding the pen the ink well cover will be drawn back, to allow the pen to be dipped in the ink, and when the lever is released a spring acts to automatically close the cover.

The manufacture of hydraulic cement forms the subject of a patent issued to Mr. John Dimelow, of Post Oak Grove, Travis County, Texas. The object of this invention is to utilize waste mineral or rejected hydraulic matter, as decomposed limestone, river deposits, clays, etc., by pulverizing or grinding the calcareous material, the invention being an improvement on a former patented invention of the same inventor.

A lamp is the subject of two patents issued to Mr. Charles Pabst, of Philadelphia, Pa. This invention covers a combination of a lamp for burning kerosene, with standard, reflector, and smoke bell, so arranged as to be convenient in use, simple in construction, easily adjusted on its support, and ornamental in appearance. The lamp may also be made double, to be held on a standard, hung on a wall, or placed on a table or other support.

A knotter for grain binders has been patented by Mr. Edward Ebi, of Cedar Rapids, Iowa. It is designed to be attached to the platform of a reaper beneath a low platform which serves as a binding table, and which is connected at its forward edge with the platform by an inclined apron, being made in such a manner as to occupy but little space, and be thus adapted for use on the ordinary sweep or table rake reapers.

A barrel has been patented by Mr. James Cosgrove, of Flatbush, N. Y. The blank for making the barrel is formed of paper with two or more re-enforcing strips of veneer incorporated therein transversely to the barrel, lateral triangular incisions extending to the strips, the hoop being made of alternate layers of paper and veneer rolled to a flare or taper, and the head of two or more layers of paper or strawboard with a re-enforcing rim of veneer or stiffening material incorporated between the layers at the edges.

Business and Personal.

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

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Minerals sent for examination should be distinctly marked or labeled.

(1) G. H. H.—We fear that your only remedy for nearsightedness lies in the use of suitable glasses.

(2) J. G. C.—Opacity is supposed to be due to the reflection of light by particles or atoms of matter not in absolute contact or fusion. Transparency is never perfect, but is believed to be due to the chemical fusion or union of the atoms composing the mass.

(3) H. S.—The water level of a mine is the level at which natural drainage takes place. It has no relation to the sea level.

(4) H. B. H.—An air jet in a chimney has no value unless under considerable pressure, and of similar arrangement to the exhaust jet of a locomotive. The mere cutting of a hole for the admission of cold air by the draught of the chimney only lessens the strength of the draught, as it is the lighter gravity of the heated gases that constitutes natural draught.

(5) H. S.—For a stone jar filter, cover the opening of the faucet on the inside with a perforated pure tin plate, or attach to the faucet a block tin tube perforated with small holes, extending across the bottom of the jar. Then fill with small clean gravel 2 inches deep, and a layer of coarse sand 1 inch more; then a layer of pulverized charcoal which has been washed on a sieve to clear it of dust, 2 inches thick, on top of which a layer of clean sharp sand 2 inches thick and a layer of finer sand 1 inch thick on top, making in all 8 inches in depth. All the material should be washed clear of mud and dirt previous to packing in the filter. This may be done on two sieves of different grades, so that the fine sand may be separated from the coarse.

(6) E. H. B. asks for a paste or cement very adhesive and pliable when dry, to repair cotton grain sacks. A. Try one of the following: Pure gutta percha dissolved in benzine or benzole, or a good quality of common glue dissolved in water, in the usual way, with the addition of about ten per cent of glycerine. See also list of cements in SUPPLEMENT, No. 158.

(7) A.—You will find microphones described in the back numbers of the SUPPLEMENT; but no microphone will answer your purpose. They will not magnify or intensify the sound. Better have two telephone receivers, and place one at each ear. This will more than double the effect of the telephone.

(8) W. W. Q. asks (1) the best battery for silver and gold plating? A. Use Smee battery. A gravity battery or a Daniell's battery will answer very well. 2. The best method of preparing silver solution? A. Consult SUPPLEMENT, No. 310, for information on solutions for electro plating. 3. Is there any way of exterminating roaches from a kitchen? A. Use Persian insect powder freely, or phosphoric paste.

(9) S. M. L. asks how to find the positive or negative pole in a galvanic battery excited by a solution of sulphate of copper, zinc pole, and copper trough. A. The positive pole of a battery is on the negative plate, and the negative pole is on the positive plate. The positive plate of a battery is zinc, the negative plate is carbon, copper, or platinum.

(10) J. G. W. asks: What metals (alloyed) can be used for cocks to resist acid the longest? A. We know of nothing better than lead and glass. Cast iron is much used with lead seats. Also a hard composition of tin and copper with lead seats.

(11) F. W. W. asks: 1. Would the telephone made with U magnets, described in SUPPLEMENT, No. 142, work with No. 36 cotton covered wire? A. Yes. 2. Would carriage bolts do for the soft iron cores? A. Yes. 3. Are the magnets clamped together with iron plates? A. With plates of brass or other non-magnetic material; iron will not do. 4. If the ferrotype plates have been photographed on, does that affect their use for the telephone? A. No. 5. What is the best kind of wire to use for a line wire? A. No. 12 galvanized iron wire for out of door use, and No. 16 or 18 cotton covered copper wire for indoor use.

(12) G. H. P. asks (1) if electricity can be made to run a boat, can it not be made to run a sewing machine or scroll saw or a light turning lathe? A. It's common to run such machines by means of an electric motor. 2. Has there ever been invented an electric motor that can be attached to a sewing machine? If so, can they be purchased, where, and what the probable cost would be? If they cannot be bought, could an ingenious person manufacture one? A. Such a motor is sold by the Electro Dynamic Company, Philadelphia. You will find information on electric motors in the back numbers of the SCIENTIFIC AMERICAN and SUPPLEMENT. 3. Has there ever been invented a spring motor or something similar to clock works for the purpose of running the above named machines? A. Many such motors have been invented, but none of them has proved practical, as it usually requires more time to wind up the spring or weight and consumes more power than would be required if applied directly to the machine to be driven.

(13) C. B. B. writes: 1. Supposing an induction coil of 24 inches length by 1¾ inches in diameter in the core, primary No. 12 silk covered wire, in two layers, secondary No. 36; the whole most carefully insulated with paraffine paper and hard rubber. How many cells of battery could safely be used on this coil? Bichromate single fluid, two carbons and one zinc to each cell, plates 4½x9. A. 2 or 3. 2. Would the primary or the secondary wire be most likely to suffer from too high battery power? A. Neither wire will be injured, but the insulation of the secondary wire might be ruptured with too great a current. 3. A well known work on electricity recommends, after making the core of an induction coil of best annealed iron wires, to heat the core to redness in a charcoal fire and allow it to cool as the fire goes out. What would be the difference in effect between a core thus treated and one not heated? A. You get the best results from the annealed wire, because it is more readily magnetized and demagnetized.

(14) F. C. A. asks: 1. What size of Edison incandescent lamp would be necessary to furnish a light equal in power to an ordinary gas burner? A. What is known as 15 candle power lamp. 2. Where can the lamps be obtained, and probable price? A. From the Edison Electric Lamp Company, East Newark, N. J. We cannot quote price. 3. How many small bichromate of potash elements—half pint size—would be necessary to sustain such a lamp for say four hours? A. A large number, probably from 75 to 100. 4. How many Bunsen elements of a given size would be required for the same purpose? A. About the same. 5. Size of copper wire for connections? A. No. 8 or 10. 6. Should the elements be coupled for quantity or for intensity? A. For intensity. 7. Probable cost per month for running said light? A. It would, of course, depend upon the cost of materials, which is variable. In any event, it would cost much more than gas or any other known light. It is not economical to operate one Edison high resistance lamp by means of batteries. They can be used economically only in the large system, where a number of such lamps are connected in multiple arc. 8. Which requires the most power—to run two machines exactly similar, at a speed of 1,000 revolutions per minute, or to run one of them at 2,000? A. It would require the most power to run one of the machines at high speed. The power required to run a machine increases as the velocity.

(15) E. K. writes: I want to make a battery as described in SCIENTIFIC AMERICAN of April 11, 1885, and would like to be informed as to how strong the caustic potash should be. A. Use from 30 to 40 per cent of caustic potash.

(16) J. W. asks: Which pulls the most of two horses pulling on a wagon, when one horse gets ahead of the other and keeps ahead, so the evener is six inches at one end in advance of the other end, each horse pulling the same distance from the center? A. If both horses go at the same speed, they must necessarily pull alike, no matter what the position of the evener may be.

(17) J. W. asks how to construct a cheap medical battery. A. Consult the back numbers of the SCIENTIFIC AMERICAN and the SUPPLEMENT.

(18) V. S. Z. asks: Which is easiest drawn up a hill or incline plane by horses—a wagon with, say, wheels 3 feet diameter or a wagon with wheels 4 feet 6, axle friction relatively equal, and everything else equal? A. The wagon with the larger wheels.

(19) J. K. asks the best fish bait for perch, catfish, and buffalo. A. Angle worms and minnows for perch and catfish; for buffalo fish, wet cotton rolled in flour to make a fibrous dough that will remain on the hook.

(20) A. M. asks the best way to braze or solder together two pieces of copper wire. In winding a dynamo, the joint should be no larger than the rest of the wire, but I cannot make a joint that will hold, without making the wire so brittle as to break. A. File the ends of the wire to form a long scarf, so that when the two ends are placed together, the diameter will be no larger than the rest of the wire. Rub up a little borax with water on a slate or porcelain slab until the mixture of the borax and water is of about the consistency of cream; apply this to the contact surfaces of the wire, and fasten the ends of the wire together upon a piece of pumice stone. Apply some silver solder to the joint, and heat the wire with a blowpipe until the solder flows. A joint thus made will be as strong as the rest of the wire, and no larger.

(21) T. B., Jr., asks (1) how to make the compound to be used in the Grenet form of battery, in which it is only necessary to add water to produce the exciting liquid. A. It is made by adding sulphuric acid to pulverized bichromate of potash. 2. How are the castings made, and what are they made of, in the miniature toy engines? It is more brittle than lead, and much whiter. A. Of type metal (lead and antimony) or an alloy of tin and antimony. 3. Recipe for Javelle water. A. Consult SUPPLEMENT, No. 314. 4. In making a permanent magnet, would there be any gain in attractive power if the piece of steel was tempered and magnetized at the same instant by being drawn to its proper color while under the effects of a powerful helix? A. It would be difficult to say what the result of such treatment would be.

(22) In the SCIENTIFIC AMERICAN of July 18 (question 46), S. J. H. asks for some means by which the odor of a new refrigerator can be gotten rid of. If, by the use of charcoal and a good washing and airing, the odor is still retained, I advise him to have the refrigerator taken apart, to see that there is no pitchpine in it. I had an ice box that troubled me in the same way. Investigation showed that a piece of pitchpine had been used in building it. The odorous piece of wood was removed and the ice box has been in constant use ever since, and has not scented the contents once.—W. B. H.

(23) W. J. W. asks: What are the colors used in drawing to represent iron, wood, brass, etc.? A. Iron, Prussian blue; wood, raw sienna; brass, chrome yellow; brick, crimson lake; copper, pale scarlet.

(24) G. F. H. asks (1) if the dynamo described in No. 161 of the SUPPLEMENT is suitable for nickel or silver electro-plating or not, and how to proportion a machine of the same kind, of double or treble its given size? A. The dynamo referred to will answer for electro-plating, but it would be better if it were wound with coarser wire, say No. 12 for the armature and No. 10 for the magnet. In making a larger machine for electro-plating, follow the general proportions given, and you cannot go far wrong. 2. The best forms of battery for working on a closed circuit, suitable for burglar alarms, etc.? A. The ordinary gravity battery will answer your purpose.

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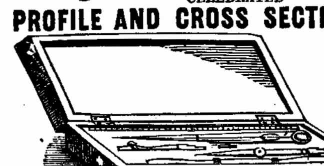

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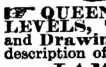

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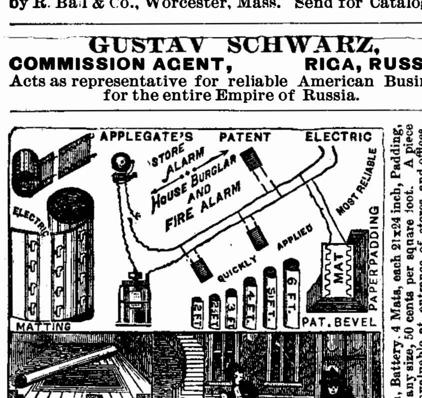

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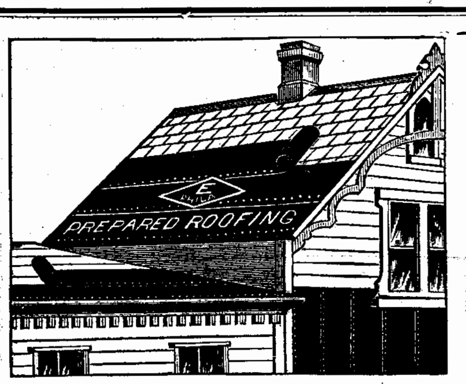

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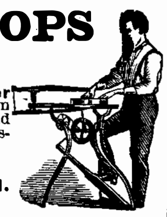

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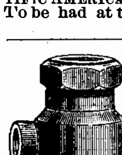

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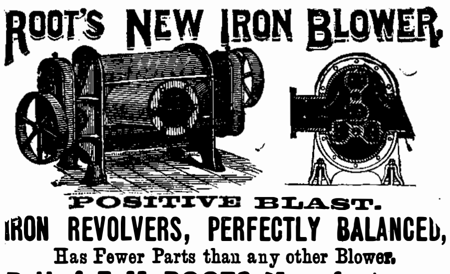

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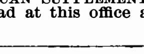

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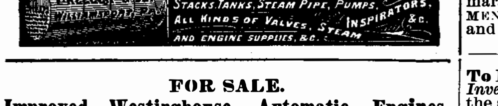

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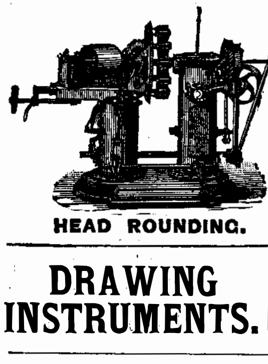

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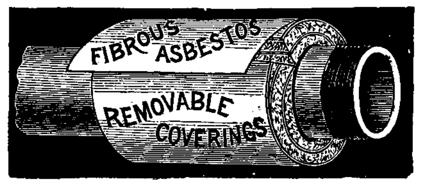

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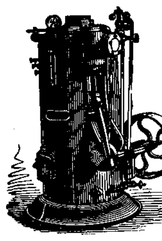

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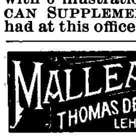

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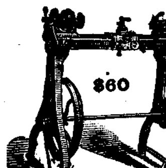

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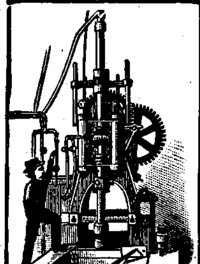
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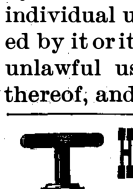

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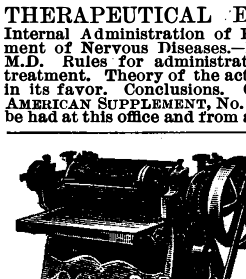

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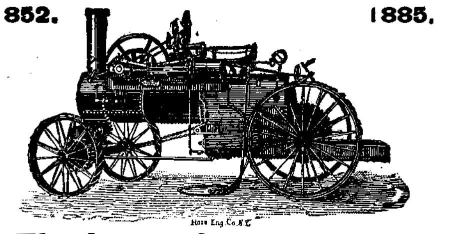

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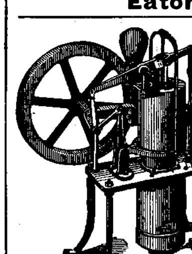

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