SCIENTIFIC AMERICAN

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THE NEW ORLEANS EXPOSITION.

EXHIBIT OF THE RAND DRILL COMPANY.

A noteworthy exhibit in the machinery department of the New Orleans Exposition is made by the Rand Drill Company, of 23 Park Place, New York city. Their display is well deserving of close attention and study, because it is representative or typical of the apparatus they manufacture, and also for the reason that it contains specimens of all the most important tools now in daily use in mining and tunneling, from the mammoth air compressor to the smallest drill. As such it may be considered as showing the present condition of that branch of engineering which is confined to underground problems; or it might be more appropriate to state that it contains those tools which have made possible the grand works of the mining engineer of the present day. It also clearly illustrates the superiority of the means we now have at our command for removing rock, whether in mine, tunnel, or quarry, compared with the few and, from our present standpoint, insignificant appliances of olden times.

The accompanying engraving shows the source of power—the air compressor—and the rock drills which utilize that power. These being the two most prominent features in the plant when fitted for active operation, we may omit a detailed description of all the smaller devices which, although most essential, occupy minor positions.

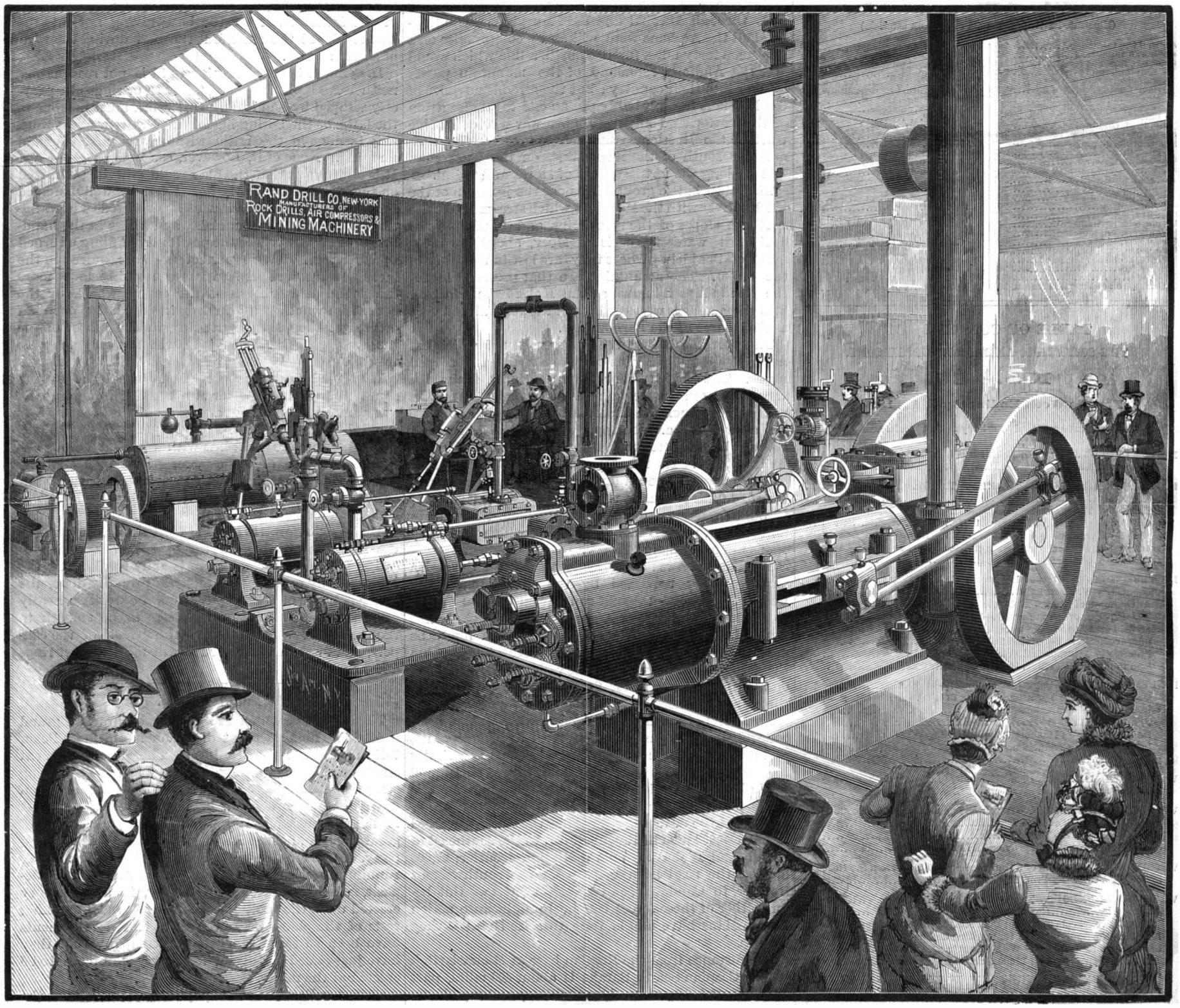
The engines in the duplex air compressor are provided with adjustable cut-off, and are mounted on extra heavy frames, so disposed as to take the strains in direct lines. The machine is easily accessible in every part, and is so designed as to be readily available as an engine as well as a compressor. The cut-off can be adjusted by a hand wheel while the machine is in motion, the point of cut-off being shown upon a graduated scale. In case of sudden loss of pressure from any cause—the breakage of air pipes or the like—an ordinary ball governor prevents the engine from running away. Attached to this governor is a pressure governor, the duty of which is to slacken the speed whenever the air pressure reaches the maximum desired. The air and steam cylinders are in line, and are tied together by a heavy cast iron sole plate and tie rod. The flywheel is made very heavy, to insure smooth motion when it is necessary to run one side at a time.

It will be seen that the compressor really consists of two perfect single engines, and it is the practice of the Rand Company to furnish, when desired, one side only, and when greater capacity is needed, to add the other side. Poppet valves are used in the air cylinders. The inlet valves are of steel, and consist of two pieces—the valve proper and the stem—put together on a taper and then riveted; they are protected by a steel guard plate, rendering it impossible for them to fall into the cylinder. A simple device protects the valve from violent slamming. The outlet valves are of brass.

The method of absorbing the heat of compression is most perfect. The air cylinder is made of hard brass, owing to the better conductivity of that metal, and as thin as is consistent with safety. The cylinder heads are hollow, and have water circulating through them; the piston and piston rod are also hollow, and by means of a telescopic arrangement of tubing at the back end of the cylinder are kept supplied with cold water. The piston packing consists of four composition rings arranged in pairs at each end of the piston.

Before escaping, the water of the piston circulation is made to pass between these rings completely around the piston in contact with the inside cylinder walls. The practical value of this method of cooling was shown in a recent experiment with one of these compressers and with one having the ordinary thick iron jacket around the cylinder only. With this compressor the temperature of the escaping air was 215 degrees less than the theoretical temperature due to pressure, had no heat been absorbed; while with

(*Continued on page* 245.)



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NEW YORK, SATURDAY, APRIL 18, 1885.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 485,

For the Week Ending April 18, 1885.

Price 10 cents. For sale by all newsdealers.

WAR BETWEEN ENGLAND AND RUSSIA.

The capture of Penjdeh by the Russians, March 30, seems to put an end to peaceful negotiations concerning the disputed boundary of northwestern Afghanistan.

Though occupied by Afghans, Penjdeh lies in a region claimed by Russia to have belonged to its lately conquered neighbor, the Amir of Bokhara, and therefore should be surrendered to the conqueror. This claim was disputed by the Afghans and their allies, the British, and a survey commission had been appointed to examine the ground and fix the proper boundary, an agreement having been come to that neither party should move until the question was properly settled. Whether the conflict was provoked by the Afghans, as the Russian commander alleges, or was a sheer breach of faith on the part of the Russians, as the English assert, does not much matter. The war is actually begun, and it seems to be mainly a question of promptness and dash whether the Russians are able or not to settle the frontier question as they will, at least for the time being.

The nominal northern boundary of Afghan Turkestan, as shown on English maps, runs almost due east from Sarakhs, near the northeastern corner of Persia, to the southernmost bend of the Amu Daria, and thence along that river to its sources in the mountains of Hindo-Koosh. In the west that line crosses a desert region, without fixed inhabitants, and always in dispute between the semi-independent tribes of the ill-defined political border between Afghanistan and Bokhara. More than twenty years ago Prince Gortschakoff, speaking for Russia, said that the fleeting sand grains of the steppes were incapable of forming a frontier line, and that only the inhabited and arable part of the country would answer for a solid line of demarkation. The Russians have been pursuing that phantom "solid line" across the steppes until they have pushed it across Khiva, Bokhara, and Kokhand to the mountain frontier of Afghanistan proper.

The old frontier of Afghan Turkestan through the desert did not fulfill the prescribed conditions, and a better one was demanded, running east frem Zulfirkar Pass through Akrobal and Bala Murghab. The English and the Afghans were willing to compromise on a line some forty miles further north, a line which would give the Afghans command of the mountain passes leading into their country; but the forcible advance of the Russians has probably put an end to all discussion of the matter, and only a stubborn war will determine whether the Russians stay their course for the time north or south of the mountains, on the Turkoman side or along the fertile valleys of Herat and Cabul.

The latest battle ground lies near the junction of the Kushk River with the Murghab, which streams drain the northern slopes of the mountains, and flowing to the northwest water the oasis of Merv, about 100 miles north of Penjdeh. There they are lost in the sands of the desert. The mountains are that prolongation of the Hindo-Koosh known as the Koh-i-baba, forking into three ranges westward under the general and very ancient name of the Paropamisis.

The Murghab River, the upper valley of which has never been explored, rises between the first and second range. The Heri Rud, or River of Herat, drains the valley between the second and third ranges, the middle range being much the highest, rising in places to 20,000 feet above the sea. The upper valley of the Murghab is inclosed by high mountains, and is said to be fertile and well watered. Its inhabitants are Mongol Hazards. At the foot of the mountains, near Bala Murghab, where the road from Maimana to Herat passes, the river runs through a narrow defile. At Penjdeh, about forty miles below, it enters a broad valley, which gradually opens upon the plain of Merv.

The Kushk flows more directly northward, through a narrow valley traversed by the direct road from Penjdeh to Herat—the best route from Central Asia to Herat and the heart of Afghanistan. It is along this route that the Russian advance will most likely be made. Robat Pass, 45 miles north of Herat, leads from the valley of the Kushk into the valley of the Heri Rud, and is where the severest fighting is likely to occur if the Russians meet with serious resistance north of Herat. Here the Amir of Afghanistan is said to have concentrated a considerable force. At other points, east and west, the mountains are said to be practically impassable by troops. There is, however, a fairly good road along the Persian frontier, and a Russian force is reported as advancing toward Herat by it.

To meet the advancing Russians, the English are said to have 30,000 men at Rawul-Pinde, to the southeast of Cabul and Peshawar, on the Indian frontier; 27,000 men on the road from Quetta, on the southwestern frontier, to Candahar; and 35,000 at Quetta. But before either of these forces can be brought into action the Russians have ample time to seize Herat if they wish to.

The distance from the Russian base at Michaelsvitch on the Caspian Sea to Saraks is about 400 miles, part of the route being covered by a military railway. From Saraks to Herat, as a bird flies, is about 100 miles, the actual route being probably double that distance.

Herat has a population of about 50,000, and is the capital of the province of the same name. It is situated in a fertile plain 2,500 feet above sea level. The plain is watered by canals from the Heri River. The city is 360 miles due west from Cabul, the capital of Afghanistan, and about 200 miles southeast of Merched, the principal city of Persian Khorassan. From a military point Herat is of great importance, as it commands the only route for an army from the northwest to Hindostan. For this reason it has been called the Gate of India. The city has been a strongly fortified post from the earliest times, and recently its defenses have been strengthened to meet the requirements of modern warfare. Candahar, the next place of importance on the route to and from India, is 265 miles southeast of Herat, and has a population somewhat greater. It is fortified, and is a place of considerable manufacturing importance. Cabul, about the same size, is 120 miles west from Peshawar, on the Indian frontier, and 200 miles northeast from Candahar.

LATHE FITS.

In a shop visited recently, workmen were setting up an engine and pumps for utilizing ammoniacal vapor for cooling purposes. The castings were of fine charcoal iron, melted in the cupola by the nicest of coke, and run into moulds made by the most expert workmen. They turned and bored "like old cheese," as one of the enthusiastic workman declared; they were really very elegant specimens of the capabilities of cast iron. The boring and turning were worthy of the character of the iron—perfect. While looking at the process of ultimate "assembling," it was noticed that a workman could not induce the piston in a cylinder to move by quite energetic coaxing, and it was necessary to turn the eccentric shaft and shift the valve before the piston would budge. This was a fit; and it was done in the boring machine and on the lathe, with no packing rings on the piston! Here was fine work; how much of it is done in our best shops? When it was suggested that it was "too fine," facts were given from recent experiments that proved that, either with steam or with the highly attenuated ammoniacal gas, the closest fits of the initial work are the best; giving not only the best results at the start, but the best during the wear of actual service.

In cylinder boring, scraping to fit is not reasonable; neither can a piston—head, follower, or rings—be properly scraped by hand to fit; this work must be done in the lathe or the boring machine. But very exact work may be done in the lathe without recourse to hand scraping. None of it, however, can be done by the file. It is outrageous that the file should still be permitted on turned work in the lathe. Even in well managed shops this abominable practice is permitted The variations in the density of metals, and those in the handling of the file, preclude the possibility of filing a turned cylinder true. Where perfect fits are required in the lathe, as plugs for template gauges, nothing can be more exact than the grindstone, the emery wheel, or the corundum wheel, used in a grinding lathe or in an ordinary lathe with the grinding wheel mounted on the tool carriage. But some jobs will not pay for this trouble.

Very good fits may be made in the lathe by the square nose tool and water or oil. This is known as the "water polish;" but it is a polish only incidentally—it is a finish really. For doing it properly the tool should be a square nose tool, but with rounded corners—a tool with a face of one-quarter of an inch, perhaps more, ground perfectly straight across, but with both corners slightly rounded by being rubbed on the oilstone; not enough to be noticed by the eye. The size of the work before this tool is used should be as near the finish as possible, shown by springing a pair of calipers over it, as the object is only to clean off the ridges left by ordinary turning. If properly done, the water polish will leave a piece of lathe work so nearly perfect that it will not only appear to be smooth to the eye, but it will respond to the "feel" of the calipers, and even the finger touch will fail to detect rings and ridges.

American Tin.

The district in which the deposit occurs is a grand uplift, the highest point of which is Harney's Peak, 7,443 feet above the sea level. The superincumbent strata have been eroded so as to expose the tin bearing stratum, and that itself has been subjected to erosion until large placer deposits have been made around the foot of the peak, yielding stream tin, or concentrate, of great richness. Since May last the Harney Peak Company, of this city, have been engaged in sinking shafts, running tunnels, etc., to ascertain the extent of the deposit, while Professor G. E. Bailey, in a laboratory erected upon the spot, has been employed in making tests of the character of the ore. The developments have been so satisfactory to the company that they have just closed a contract for a sixty stamp mill to be erected at the mines.

Professor Bailey read a paper recently before the New York Academy of Sciences, embodying the results of his observations.

Geology of New Jersey.

Professor George H. Cook, for many years State Geologist of New Jersey, in his annual report for 1884 presents a good deal of most interesting information, but in his work the Professor never loses sight of the practical, assuming that "whatever will turn its products to practical use may be the subject of its descriptions; whatever will help to make these natural resources known to and understood by the great body of the people comes within its bounds." The work of the past year was devoted to making good topographical and geological maps—of which those already issued are beautiful specimens of the most careful and comprehensive workmanship—to intricate problems of structural geology, and to questions of water supply, drainage, and other topics connected with economical geology, such as iron mines and mining industry, statistics of iron and zinc ores, etc.

One chapter of the report which will attract especial interest is that treating of the fine exposure of basaltic rock, in beautiful prismatic columns, on the southeastern slope of Orange Mountain, which was much talked of last summer. It was made in quarrying material for road making, for which this tough and heavy rock of igneous formation is particularly adapted, and there is now exposed a vertical face of rock 700 feet long, 30 feet high at one end and about 20 feet high at the other. The columns are as regular in their form as if they had been dressed out by a stonecutter, are generally parallel to each other, and packed together so closely that there are no vacant spaces or openings, the surface of most of them being marked as if they were regularly laid up in courses like bricks in a building. These courses are about as thick as common bricks, and have about the same inequality or unevenness of surface that buildings of ordinary brick have, the courses in adjoining columns matching each other; but they do not extend inward to affect the structure of the rock, as in breaking across the courses no traces of them can be seen in the solid and hard rock. Accompanying the report are some fine views of these basaltic columns, as photographed by Mr. H. J. Brady, of Orange.

Professor Cook also gives the details of the uncovering of the buried swamp of small white cedars near South Amboy the past summer, some twelve feet below where chestnut, oak, and other common timber had been growing, as showing a remarkable instance of geological change since the country has been inhabited by white men, and thus calls attention to the remarkable form of the ocean bottom off the New Jersey shore: "To look at it as a whole, it appears as if the real shore of the ocean was one hundred miles out from the eastern border of our State, and the intervening distance was only temporarily covered with water, like flat grounds on the borders of a river in time of a freshet. . . . For the first 100 miles out the ocean deepens only three feet to a mile, or 300 feet in all, while at 118 miles from the shore the bottom has dropped to 6,000 feet, and at 250 miles is over 12,000 feet, or nearly 2½ miles deep." The appearance, he remarks, is almost as if these shallow shores "might soon be left dry, and the ocean diminished to the area of its deep waters. Such a contraction of its area would diminish the capacity of the ocean but slightly. And looking at it in the opposite direction, it would require but a small addition to the enormous volume of its waters to make them flow inland far enough to cover the whole of southern New Jersey and all those strata which now seem to run so regularly out to sea."

Migration in Florida.

BY E. M. HASBROUCK.

The great tide of migration has turned, and the vast army of birds that annually go north are now *en route* for their breeding grounds.

Of all localities in which to study migration perhaps that of Palatka is one of the most fertile; here it commenced fully a month ago, when the yellow-rumped warbler, heading the van, was first noticed, Feb. 8, in sparse numbers in the woods and among the trees about the town.

Unfortunately, I was not enabled to get out again until Feb. 21, when I found them in immense numbers scattered through the swamps, woods, orange groves, along the roadways, and even hopping about on the doorsteps, and peeping into the windows from the slats of the blinds. They spent their time busily engaged in catching insects, and I have often seen them balancing themselves on their wings like humming birds in front of flowers to catch the insect within.

They remained scattered until about March 18, when they began to gather in large flocks, still, however, frequenting the open places, were they could be flushed like quail, alighting again within a few rods. They soon began to leave, and by March 24 were nearly all gone, and at this date—March 28—only a few individuals remain where five days ago were thousands. The next bird to arrive was the chipping sparrow, who did not put in an appearance until Feb. 21, when in the evening I flushed quite a large number from the scrub palmetto where they were roosting; this is the only instance I have recorded of its being here. Henslow's bunting also put in appearance Feb. 21, in the shape of a hand-some male specimen; I started him out of some short grass on the edge of a small lake, and after flying a few feet he "pitched" after the manner of woodcock, and squatted flat in the grass; fortunately I could see him quite plainly, and noticed that his wings and tail were spread, and his head turned toward me with beak partially open, much after the fashion of night hawks in attempting to decoy an intruder from the vicinity of their eggs or young by feigning lameness. I have not seen one since, and think them to be quite rare here. On March 4 the weather changed to warmer, cloudy, and inclined to rain, with due south wind, bringing three purple martins, the first of the season; they spent the day in circling over the town, and were observed again on the following day.

On March 5 I was called away, and did not return until the 26th, when I found considerable numbers flying over the town. The next bird that came under my notice was the cat bird; although I have met with them occasionally during the winter, they did not begin to appear in any number until March 11, when they were quite numerous in the bushes bordering the banks of streams, and in most of the thickets. Although I did not make note of it at the time, I think I heard one individual attempt to sing, but he did not make a success of it; they, however, were constantly uttering their plaintive cry, from which they derive their name. The blue yellow-backed warbler also put in appearance on March 11, late in the afternoon, in the shape of a single male bird, which was found in an orange grove. During the night the weather moderated, and on the following day, March 12, passing through the same grove, I succeeded in finding eight of them.

Between the nights of March 11 and March 13 a strong warm wind sprang up from the south, bringing with it large numbers of these birds, and on March 13 they were numerous, not only in the groves, but in the woods and swamps. Up to this time I had heard no song, only a single "chip" being repeated at intervals as the birds hopped from limb to limb in search of food; but I now began to detect a faint warble uttered occasionally between the "chips," as though the birds were just commencing to tune up, but they were not in full song until March 25, when they were as numerous as the yellow rumps had been before them, and could be heard singing in every direction. They are still here (March 30) in large numbers, though gradually working their way northward. The same warm wave that brought in the blue yellow-backs proved to be favorable for other species, for on the same day I noticed the first ruby-throated humming bird, a single male specimen being seen in the woods around the wild honeysuckle; also the black and white creeping warbler was seen in the swamps to the number of four, and as usual were busily running up and down the tree trunks in search of insects. The humming bird I continued to see until March 23, when they appeared in considerable numbers in the woods and swamps, and at the present date, March 29, they are very common about the gardens and orange trees.

The creepers continued to increase until March 24, when they were and are still very common, both in the woods and swamps and in the groves. On March 16 the Maryland yellow throat (although here in considerable numbers throughout the winter) began to be more common, and for the first time since coming south in October, I heard him utter his song. It proceeded from the depth of a thicket, and as I did not at first recognize it, I made a careful search until I discovered its source. At present date, March 25, they are not common, but more numerous than previously, and their song is often heard. The white-throated sparrow also appeared on March 16, four or five being seen in the bushes, along the water courses. I only heard a single "ch-e-e-p" uttered occasionally, and do not think they get into song until they arrive farther north. Their plumage also is less brilliant here than when it first appears in the Middle States, especially the white stripes on the head, which are tinged with brown.

The next bird I have recorded is the swallow-tailed kite, when on March 18 I noticed three individuals circling high in the air over the swamps. I did not see them again until March 21, when I saw four in the same place, but flying low down, and making frequent swoops toward the earth with loud screams. On March 23 I noticed what I took to be the first sign of the approaching migration of the mourning dove, viz., the "cooing" of said birds. It is a well-established fact that these birds on their arrival in the Middle States are "cooing," and almost the first intimation we have of their presence is the sound of their notes in the woods and orchards. It is also known that these birds "coo" *only during the mating and breeding season*, and the rest of the time they are *silent*.

Putting these facts together with the fact that they are "cooing" here leads me to think that these birds (which have been wintering here) are about to start on their journey north. On March 23 I noted also the first hooded warbler; he was among the young trees on the edge of the woods, and was so shy that I could not secure him; but on the following day, March 24, I secured two handsome male specimens in the same place, and saw a few more in the woods and swamps, all low down near the ground, busily catching insects. The yellow-throated warbler also arrived on March 23, and was represented by a single female specimen, which I secured as she was hopping about the branches catching insects, and on the following day, March 24, I secured two more females, not seeing a single male bird, whereas all the aforementioned birds of each variety were males, not a single female recorded as either having been secured or seen. March 24 two more arrivals, viz., the painted bunting and the tufted titmouse, each being represented by two individuals, of the former one male and one female, and of the latter two males. The titmice were shot out of the branches of the trees in the woods, where they were catching insects and occasionally uttering a note that very much resembled that of the black-capped titmouse of the North. The buntings were in some scrub on the edge of the woods, and although I failed to secure either of them, yet I saw them distinctly enough to identify them fully.

For March 25 I had no new arrivals until late in the evening, when, returning from the swamps, I heard the first whippoorwills, and distinctly counted five birds, all singing in different parts of the woods, and at the present date, March 29, large numbers may be heard every evening. Different notes come from different birds, as, for instance, the note of one will be in a higher tone than that of another singing within a few rods of him.

Since writing the above, a friend brought me a fine specimen of a male prothonotary warbler, which he secured on March 25, it having, as he claims, flown against the window and killed himself, thus making two arrivals for March 25. The above notes carry me up to the present date, March 30. It will be noticed that I have said "up to present date" several times, each time giving a different date, the term "present date" applying only to *that* species.

A New Industry.

Porpoise fishing for the oil alone has been carried on for many years off the North Carolina coast, but last summer a company was formed with its headquarters at Cape May, N. J., not only for trying out the oil, but for utilizing the hide. The process of rendering the oil is very simple, and the average amount obtained is from 6 to 8 gallons. The experiment made last summer by this company proved quite successful, $3,740 being realized, it is said, from an outlay of $1,000 in five weeks' fishing, and its facilities for taking porpoises will be greatly increased the coming season. The skin of the porpoise makes a very superior, soft, and pliable leather, and the estimated value of each individual for its oil and skin alone was placed at $20. Last autumn it was discovered that the flesh made quite a savory dish, and it became so popular at the fashionable watering places along the coast that a Philadelphia firm recently made a proposition to take all that may be caught along the coast this season, with the view of working much of it into mince meat. The Cape May company, it is said, will reject the offer, as it already has offers from prominent Philadelphia and New York hotels and restaurants, and it is believed that there will be a demand for the meat which cannot be met.

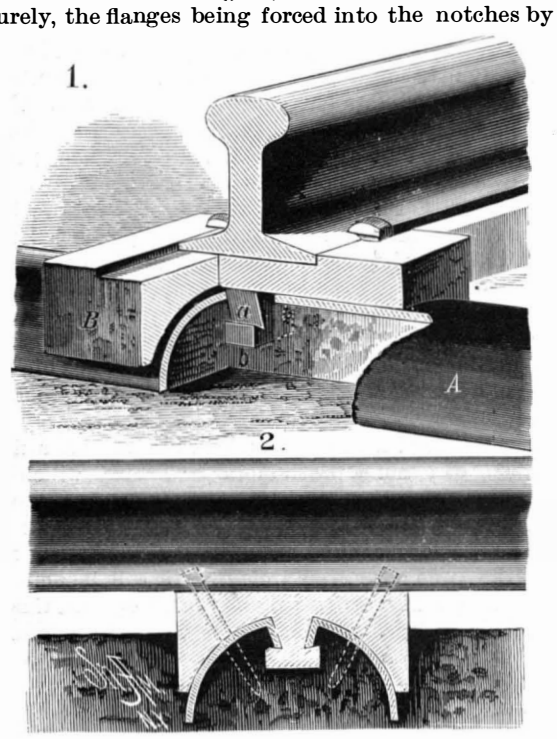
The meat is red and juicy, and resembles in appearance beef, but is more solid, finer grained, and very tender; much more like venison, which it resembles in flavor. They are taken in seines about 1,000 feet long and very wide, and when captured, if not already drowned, are killed by stabbing with knives. It would seem that the outlook for the success of a new and valuable industry being established along our coast was most excellent.

Chemical Process for Ramie.

A chemical process by M. Reynaud, of St. Denis (Reunion), consists in the employment of a solution obtained by lixiviating ashes of wood, or even of the woody part of the ramie, and therefore it is a cheap process, since this woody part, besides serving for heating purposes, leaves an ash which is utilized in the process. The ash, after being treated with so much hot water to give a cold solution showing 1·025° to 1·030° specific gravity, is immersed either in the natural state or, better, slightly broken up by means of a wooden roller. After some time, varying according to the maturity of the fiber, it is taken from the bath, and the ramie is immersed in cold water; then each stem is taken separately in the left hand, and worked on and back between the index and thumb of the right hand, when by this simple pressure the skin and a large quantity of the gummy substance can be removed. The fibers are thus obtained divided to a large extent, and are found floating about in water. It is now only necessary to take them by the right hand, and to separate the fiber without any effort whatever from the wood. The separated fibers are now brought back into the original ash lye and left there for a few minutes, then well washed in running water, and finally dried in the stove or in the open air. It is easy to ascertain when the stems have been long enough in the bath by taking one out and trying it; when the skin is easily removed, then they can be taken out. The same bath can be used several times.

METALLIC RAILWAY TIE.

The tie, A, is formed of sheet metal of suitable thickness rolled into the semi-cylindrical or curved form shown in the engraving. The saddle, B, made preferably of cast metal, has its under surface concaved to set closely upon the tie. On each tie are two saddles, attached by means of dovetailed lugs, *a*, extending through holes cut in the crown of the tie. The metal is slit and bent down to form the holes, so that flanges are left which take into notches on two sides of the lug (this construction is shown in Fig. 2) to hold the saddles securely, the flanges being forced into the notches by a



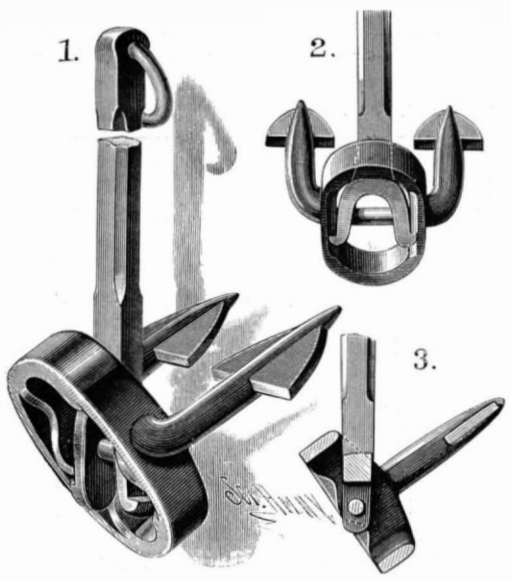
VAN ORMAN'S METALLIC RAILWAY TIE.

suitable tool. The other sides of the lugs are straight, and fit the holes snugly to prevent the rails spreading. The upper surfaces of the saddles are grooved or countersunk to receive the rail flanges, so as to prevent spreading and relieve the spikes of side pressure. The spike holes extend through the saddles, and incline in opposite directions and extend through the tie, so that tendency of the saddle to rise and the rails to rock is resisted by the clamping action of the spikes. The tie is self-tamping, since, as it settles, it gathers and compacts the dirt instead of spreading it as the ordinary tie does. Ballast takes good hold upon the rounded sides of the tie.

This invention has been patented by Mr. C. M. Van Orman, of Sherwood, Mich.

A NOVEL ANCHOR.

The anchor illustrated herewith is particularly adapted for government service for large buoys, lightships, or anything liable to foul anchor by lying a long time and swinging around; it is especially adapted for soft mud or sand, as both flukes hold at once, and the disk also holds as a mushroom anchor would. The arms carrying the flukes are rigidly attached to the head, which is pivoted to the shank by pins or rivets.



PETTES' NOVEL ANCHOR.

The head, made in the form of an elliptical ring, serves, primarily, as a double-acting stop acting against the shank to limit the pivotal movement of the arms and fluke of the anchor, upon both sides of the shank, so that they will always stand at the proper pitch.

The head also serves as a rolling surface to turn the anchor so that the flukes will enter the bottom no matter how the anchor may lie, and also as an additional hold, which is especially useful in a soft bottom, for as the flukes enter the mud the sharp curved edges of the head will hold in the mud at a point back of and between the flukes. The shank is preferably divided at its lower end to form arms, through which the rivets pass, these arms being extended past the rivets, and formed at their ends with outwardly projecting lugs; the head is recessed to form shoulders against which the lugs come, thereby relieving the rivets of excessive strain. Constructed in this manner, no stock is required upon the upper end of the shank to bring the flukes to position; this makes this anchor much lighter than the kind in common use. Again, there is no upper fluke to pierce through a vessel's bottom when anchored in shoal water and swinging over. Owing to the holding power of the anchor, a chain or rope may be secured to the head to break ground with. Besides being cheap, this anchor will occupy comparatively small space upon the deck or other part of the vessel.

This invention has been patented by Capt. James A. Pettes, of Grand Manan, New Brunswick, Canada.

The Electro-Deposition of Carbon.

Dr. Gore, F.R.S., has been making a large number of experiments on the deposition of carbon, boron, and silicon by means of the electric current. Most of these experiments, says *Engineering*, resulted in failure, or comparative failure, to deposit carbon; but several were successful. For example, he succeeded by electrolyzing in a platinum cup a fused mixture of 475·2 grains of 97·1 per cent of sodic carbonate and 217·4 grains of borofluoride of sodium. A sheet platinum anode and a thick platinum wire cathode were used. A black deposit of carbon, nearly pure, was formed on the platinum wire, and gas was given off at the anode. The current was supplied by ten Smee elements. With the same current he also electrolyzed in a platinum cup a fused mixture of 300 grains of 97·1 per cent pure potassic carbonate and 442 grains of silicofluoride of potassium, using similar electrodes. Gas rose from the anode, and at first gas only rose from the cathode too. After that streams of black matter poured down from the cathode, and the latter acquired a blackish film, but subsequently became alloyed and fused on the surface. The deposit was, therefore, partly or wholly silicon.

Again, a fused mixture of 200 grains of pure sodic hydrate, 170 grains of pure precipitated silica, and 610 grains of the mixed anhydrous carbonates of potassium and sodium was electrolyzed by a similar current employing similar electrodes. Much oxygen, relighting a red hot splint, was given off at the anode. Dark streams flowed from the cathode, sodium was set free, and if the cathode was only slightly immersed, bubbles of sodium vapor were emitted, and took fire at the surface of the liquid. After one hour's action the platinum anode had lost 0·37 grain in weight, and the cathode had a jet black deposit on it. This deposit was subsequently washed and dried; a portion of it burned with a glow when heated to redness on platinum, and left a minute residue of gray platinum. It also deflagrated with fused niter below red heat, and vividly by heating with potassic chlorate. It did not dissolve nor evolve any gas in a mixture of strong nitric acid and pure concentrated hydrofluoric acid. It was, therefore, not silicon, but carbon containing a minute quantity of platinum.

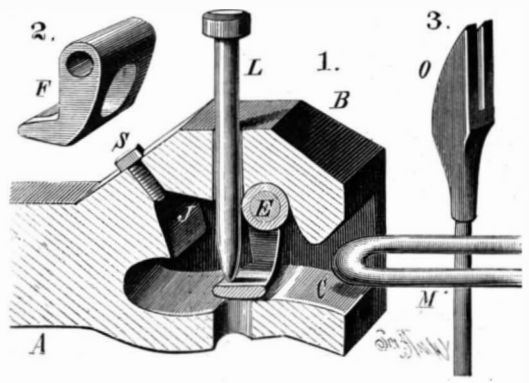
Dust Explosions.

Speaking about dust explosions, says the *Milling World*, a case from Germany is worthy of notice. A sack of flour, falling down stairs, opened and scattered the contents in a cloud through the lower room, where a burning gas flame set fire to the dust, causing an explosion which lifted a part of the roof of the mill and broke almost all the windows. There can be no doubt that the majority of dust explosions are, like mine disasters, due to open lights, and as this danger can be practically avoided by the use of the incandescent electric lights, there really seems to be no valid reason why it should not be introduced more generally, as those establishments which have used it express themselves in its favor. No matter how carefully other lights are guarded, an absolute safety, as long as the globes are intact, is offered only by the incandescent lamps, where the atmosphere or the dust has no access whatever to the flame. The above instance teaches also how little is necessary to start an explosion in the cleanest mill, so long as open lights are used; how much greater must the danger be in establishments where the air is constantly charged with dust, and where cleanliness is looked upon as of minor importance!

IN our issue of April 4, we published a description of a grain drier and cooler, patented by Mr. S. E. Worrell, of Hannibal, Mo. The machine is applicable to the drying of green coffee and substances containing a large percentage of water, which requires much time for its removal so as not to injure the berry. For this purpose return conveyers are used, the grain, after it has passed through the first drier and cooler, being returned to the head of the second set, and so on until it has passed through the whole gang. Its passage can be regulated by raising or lowering the discharging end.

IMPROVED CAR COUPLING.

The top of the drawhead has a transverse raised part formed with a vertical pin aperture. In the top of the link opening, C, is a recess in which the transverse shaft, E, is held; placed on the shaft in such a manner that it can swing within the opening is the tripping plate, F, shown detached in Fig. 2. This plate is formed with an aperture and with an inwardly projecting flange on its bottom edge, and is of such length that when hanging vertically its lower edge is near the bottom of the opening. In the top of the opening is the recess, J, into which the flanged portion of the plate can swing. Usually the plate hangs vertically, and the pin, L, rests on the flange, when the drawhead is ready for coupling. As the link, M, enters, it strikes the bottom of the plate and swings it inward and from under the pin, which is allowed to drop through the plate aperture and through the link. To uncouple the cars, the pin is raised by means of the



NICHOLAS' IMPROVED CAR COUPLING.

fork, O, Fig. 3. The swing of the tripping plate is regulated by the screw, S, which enters a diagonal hole formed in the rear part of the drawhead.

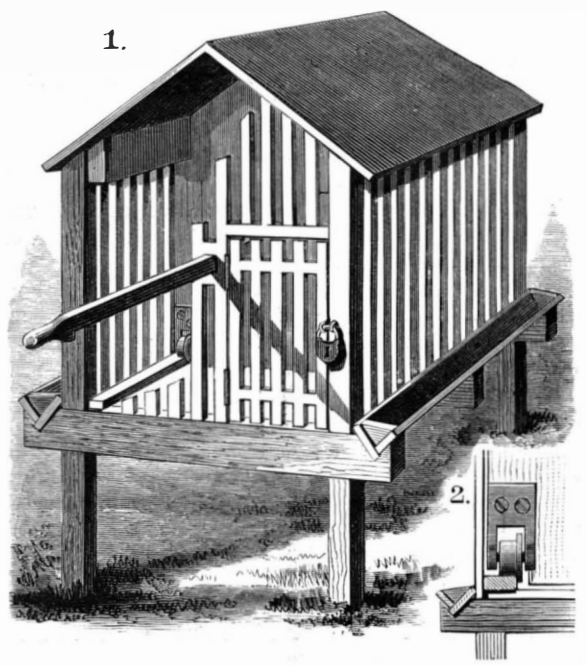
Particulars regarding this car coupling can be obtained by addressing the inventor, Mr. Thomas Nicholas, of Calumet, Mich.

Diluted Coal Gas.

Coal gas, well purified and mixed with six times its volume of air, has a heating power of 5,200 cal. per cubic meter at 0° and 760 mm. Before purification its heating power is 5,600 cal. The heating power of gas is increased by 5 per cent when it is mixed with 1·25 vols. of oxygen; but, on the contrary, it is diminished by 4·6 per cent when diluted with 11 vols. of oxygen. This rule does not hold good when the gas is mixed with common air.

FOWL COOP.

The fowl coop herewith illustrated, lately patented by Mr. R. W. Goddard, of Wellston, Ohio, is so constructed that it can be adjusted to form compartments of different sizes. It is made of slats, and is mounted upon legs. The transverse partition is provided at each lower corner with a forked clip (Fig. 2), in which a flanged wheel is pivoted. Projecting from the middle of the partition, and extending through one end of the coop, is a bar formed with a shoulder at a distance from



GODDARD'S FOWL COOP.

the partition, about equal to the length of the coop, which has a door at each end. At each side of the floor are tracks for the wheels to run upon, and a feed trough is placed at each side of the floor outside of the coop. The partition divides the coop into two compartments, one large and one small, or both of the same size. By means of the bar, the partition can be moved to any part of the coop according to the size of the compartments desired. The bar projecting through the end of the coop holds the partition in a vertical position, and also serves as a roost for fowls.

Infringement of Patents.—Street Cars.

The case of Stephenson *vs.* the Brooklyn Crosstown Railroad Company, decided by the Supreme Court of the United States on the 23d of March, was a suit for the alleged infringement of three patents, upon improvements in what are commonly called "bobtailed" or one-horse street cars. The improvements set forth in the specifications of the patents were, first, the lever and bar enabling the driver to open the rear door of the car; second, the bell cords running along the sides of the car over the windows; and, third, the mirror over the driver's head to enable him to see the interior of the car without turning around. The court holds that these improvements, so far as they embodied any patentable device, had all been anticipated by other persons before the patents here in controversy were issued, and that such patents were consequently void.

A New Use for Asbestos.

In the processes connected with dyeing and printing of cotton cloth it is frequently necessary to hang the fabric in loops from parallel rods for the purposes of exposure to steam, air, or ammonia. In order that the cloth should hold upon the rods without slipping or being strained, it is necessary to wind rope or strips of cloth around the rods, but this only mitigates the difficulty without accomplishing its removal, for the heat and corrosive action of the vapors rot any covering in a few weeks, and the first notice of any deterioration is generally the appearance of small pieces of roll covering among the cloth in process of finishing. Recently asbestos rope and asbestos cloth has been used for this purpose, and proves to be very durable. Larger ropes of this refractory material have been used for the transmission of power over places exposed to heat.

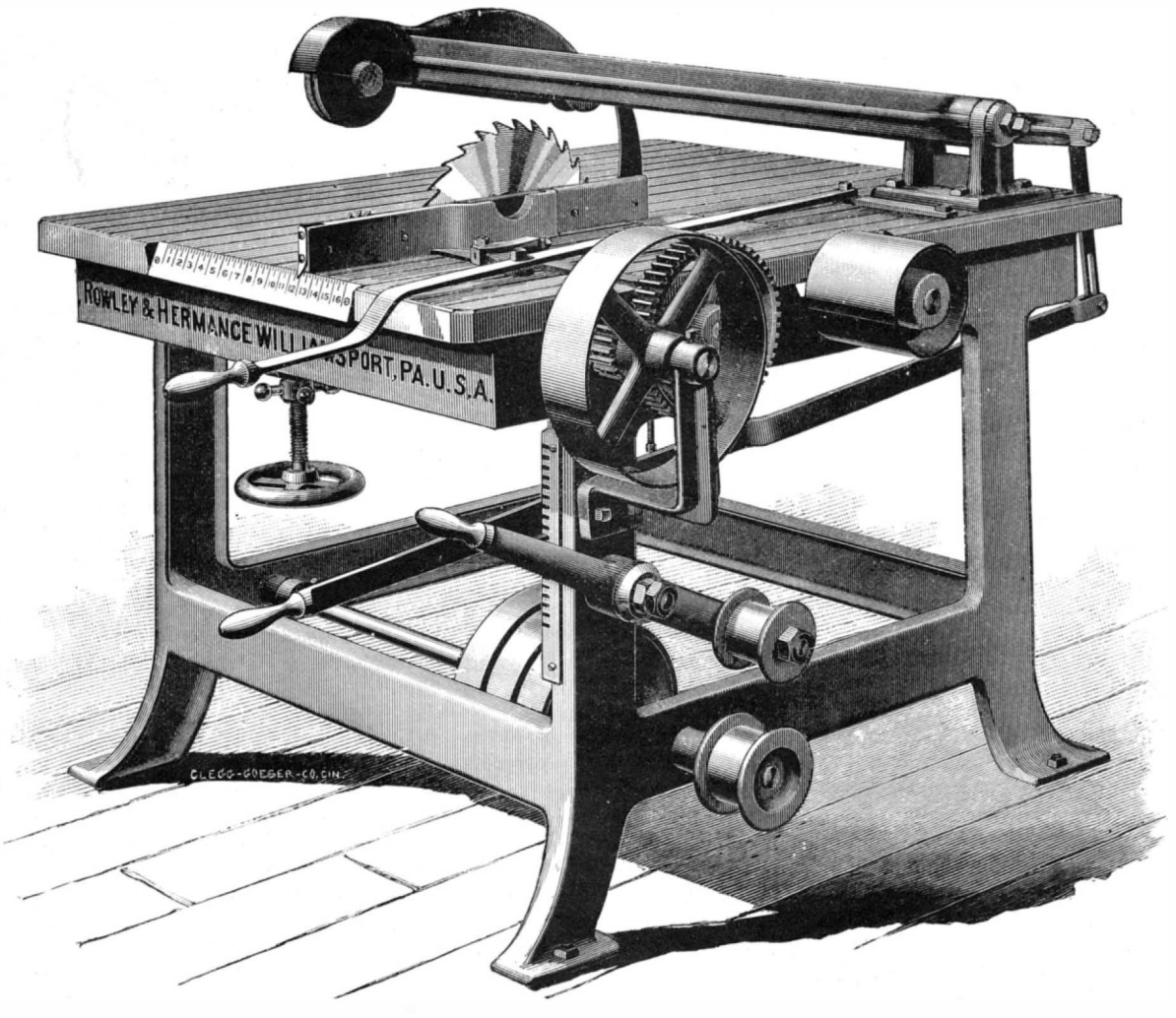
SELF-FEEDING RIP SAW TABLE.

The self-feeding rip saw table shown in the accompanying illustration is intended to take the place of the ordinary hand feed rip saw, and is designed for ripping lumber into strips of any width up to 16 inches wide and 6 inches thick. The frame is very heavy and strong, and is made entirely of iron cast in one piece; the table is of hard, well seasoned wood, glued up of narrow strips. The table is hinged at the back end, and can be raised or lowered by means of a hand wheel screw at the front end, as shown in the engraving. This admits of the table being raised above the feed saw, and by throwing the pressure arm out of position the machine can be used as an ordinary hand rip saw table.

There are three rates of feed, slow, medium, and fast, being at the rate of 45, 100, and 160 feet per minute, respectively. The feed works, being very powerful, are capable of ripping 3 inch plank at the same speed as 1 inch boards; the feed roll marks are taken out by the saw, leaving no mark on the lumber. Starting and stopping are accomplished by means of a tightener.

A new and valuable feature is the setting device. The gauge can be set at any mark of the index plate, or at any fraction of an inch, and by a slight movement of a lever can be held rigidly in position. The arm, with pressure roll, presses the lumber down on the feeding saw sufficiently to insure a strong and reliable feed. The pressure arm can be instantly adjusted to different heights by the lever running under the machine, the handle being within convenient reach of the operator. When in operation the saw is covered by a shield and the table is provided with a spreader, making it impossible for a board or short pieces to be caught and thrown over the saw thus avoiding accidents arising from this cause. The saw is run at a speed of from 2,800 to 3,000 revolutions per minute.

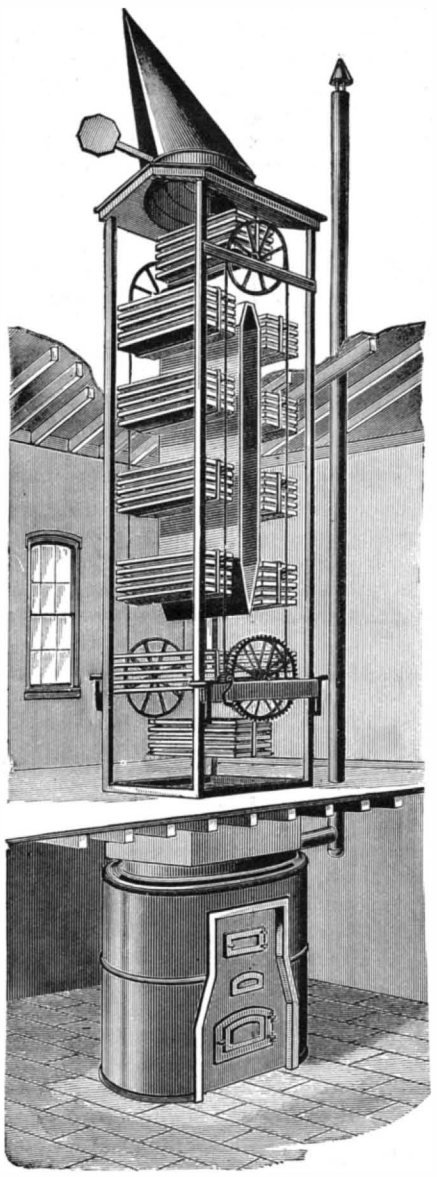
The machine is well-proportioned and strong in all its parts, and the makers, Messrs. Rowley & Hermance, of Williamsport, Pa., state that by replacing hand rip saws with it the capacity may be doubled with less hard work, and the liability of accidents be lessened.



ROWLEY & HERMANCE'S SELF-FEEDING RIP SAW TABLE.

EVAPORATOR FOR DRYING FRUIT, ETC.

The Williams evaporator, herewith illustrated, is designed for the drying of fruit, vegetables, etc., and while being simple in construction, easy to handle, and



WILLIAMS' EVAPORATOR FOR DRYING FRUITS, ETC.

continuous in operation, there is no danger of overdrying or burning the fruit.

The evaporator consists of a vertical trunk about 32 feet high, 5 feet 1 inch wide, and 5 feet 8 inches deep, divided by a partial partition into two evaporating flues, through which the fruit to be dried is slowly passed. At the top and bottom of the trunk are shafts, each of which carries two wheels; the upper and lower wheels are connected with endless chains formed with projecting pins, from which light frames are suspended.

Between the frames filled with trays are spaces of about 15 inches, forming a number of air chambers at certain intervals in the flues. On two sides of the trunk are doors conveniently located for putting in and taking out the trays. The heaters require no masonry, and either wood or coal may be used as fuel. By means of a damper the heat may be thrown into either or both flues at will, and the operator is enabled to control the heat as occasion may require.

The trays containing the green fruit are inserted through a small door, about 4 feet above the furnace, and passed downwardly directly over it, thus heating the fruit rapidly to as great a degree as it will bear without materially changing its color. When first put in, the degree of heat may be very high without danger, since the fruit is cool and contains all its original moisture, and the hot air surrounding it is free from vapor, and will not penetrate and scald the fruit as moist air would. It then rises gradually through the hottest flue, the hot air being thrown under the trays by deflectors on the inside of the walls of the flue; the heated air and vapor pass off at the top. While rising, the greater degree of heat the outside of the fruit received while passing over the heater diffuses itself through the fruit; and while descending the other flue to the operator, the drier fruit, preceding the moist, enters the increasing heat, and arriving at the door is removed by the operator, who inserts another tray of green in its place, thus making the operation continuous. The fruit, having been dried in the least possible time, and having been uninjured by scorching or cooking, retains its original color and flavor. The construction of this apparatus enables the operator to evaporate, at the same time, different kinds of fruit which require more or less time and heat.

The principle governing the construction and operation of this evaporator is sound; by first exposing the green fruit to a high, dry heat and passing it slowly to a lower temperature, and then in its downward passage through the second flue subjecting it to a dry, heated current moving upward, the fruit is not so apt to be injured as in the case of its exposure in a moist atmosphere from which it passes into an intense heat.

The capacity of the evaporator described above is 150 bushels of apples or 200 baskets of peeled peaches in 24 hours. Letters of recommendation received by the manufacturer, Mr. S. E. Sprout, of Muncy, Pa., who should be addressed for further particulars, while highly indorsing the evaporator, state that it will appreciably exceed the guaranteed capacity if properly run.

Improvement in Chimneys.

The *Building Times* (London) says the best chimneys are made by inclosing hard baked glazed pipes in a thin wall of bricks. Such chimneys will not only draw better than those made in the usual way, but there will be less danger from "defective flues." A four inch wall of brick between us and destruction by fire is a frail barrier, especially if the work is carelessly done, or the mortar has crumbled from the joints. To build the chimneys with double, or eight inch, walls makes them very large, more expensive, and still not as good as when they contain the smooth round flues. To leave an air chamber between them for ventilating is better than to open directly into the smoke flue, because it will not impair the draught for the fire, and there will be no danger of a sooty odor in the room when the circulation happens to be downward, as it will be occasionally. The outside chimney, if there is one, should have an extra air chamber between the very outer walls and the back of the fireplace to save heat, a precaution that removes, to a great extent, the common objection to such chimneys. A very large per cent of fires comes from defective chimneys.

Rules of a Carriage Factory.

The following rules govern the factory of James H. Birch, of Burlington, N. J. The *Carriage Monthly*, from which we copy, thinks "they have a mighty business sort of ring":

1. If you do not mean business, you are not wanted.
2. Running to beer shops in working hours will positively not be allowed.
3. Any one bringing spirituous or malt liquors on the premises will be discharged.
4. Wages will not be paid until six o'clock P.M., and only at the office.
5. Six days make a week, and ten hours make a day. Men working by the piece that loaf three days in a week, and then want to make a big week's work in the next three days, I will not employ.
6. All work must be done in a mechanical manner, or it will not be paid for.
7. Men working by the piece, their parts must be finished before they are counted and paid for. Any man caught giving a false account of his work will be discharged.
8. No work will be allowed taken in by employes. Material to be used only for work belonging to the shop.
9. Strictly business in working hours, as no place can be run successfully on any other principle.

The above rules will be enforced without fear or favor. Any employe not wishing to comply with them can withdraw without any controversy.

The Profits of Gas Making.

A Senate committee that has been investigating our New York city gas companies has struck on a veritable bonanza, and the pay chute continues without sign of exhaustion. It is very refreshing in these hard times to read of regular dividends of 25 per cent, with an occasional "extra" and a large reserve fund; but our admiration is greatly increased when we find these magnificent dividends are declared on stock that is largely "water" and in some cases was all "bonus," and never represented any "cash," the working capital being something, we might almost say, in general furnished by the sale of bonds.

The following are a few of the records as published in the daily papers:

The Manhattan Gas Company was chartered in 1830, with a capital of $500,000, $320,000 of which was paid in, and the balance was returned in installments, presumably out of profits. In 1847, the capital was increased to $1,000,000; in 1852, to $2,000,000; in 1855, to $4,000,000. The price charged for gas has pretty steadily declined from $7 per thousand feet in 1836 to $1.75 per thousand, the present price.

In 1874, the Manhattan Company made 377,500,000 cubic feet of gas, being at the rate of 10,352 feet per ton of coal used. The loss from leakage was 14·4 per cent; candle power, 17·32. The cost of production, $1.23 per thousand feet. Selling price, $2.50. By-products brought $143,257. The company declared, in 1875, 35 per cent. For several years past, the company has produced over 1,300,000,000 feet annually. The return per ton of coal has improved to 10,844 feet; the loss from leakage still averages over 14 per cent; the candle power has improved to about 19½; and the cost of manufacture at the meter has declined to about 66 cents and in the holder to about 50 cents per thousand feet. The selling price for four years past has been $2.25 per thousand feet. The dividends, 25 per cent, with an extra 10 per cent when the company consolidated at the close of last year. The dividends for the past ten years have averaged over 21 per cent.

The New York Gas Light Company was organized in 1823, with $1,000,000 capital. In 1871, this was increased to $4,000,000 by issuing four shares of new stock for one of old. "No cash was paid in." In the consolidation a few months ago, this company was put in at $7,560,000. The works have now a daily capacity of 6,000,000 feet. The dividends paid were 20 per cent in 1875; 10 per cent in 1876 and 1877; 8 per cent in 1878; 4 per cent in 1879; 8 per cent in 1880 and 1881; 10 per cent in 1882 and 1883; 15 per cent in 1884; average for ten years, 10·3 per cent. In 1878, this company paid the Municipal Company $300,000 for the right to make water gas under the Tessie du Motay patents, and has since used water gas enriched by naphtha. In 1879, there was a war with the Mutual Company (which also made a water gas).

The Municipal Company has been paying dividends at the rate of from 15 to 20 per cent on its capital of $3,000,000.

A few points of considerable interest have been brought out. The enormous increase of gas consumption and the more intelligent administration have reduced the cost of production in the past ten years from $1.23 to about 45 cents per thousand feet, or a reduction of over 60 per cent. The cost to consumers in the same time was reduced 10 per cent. The dividends and the value of the property were increased.

WATER GAS.

The companies that ten years ago denounced water gas as highly dangerous to the public, and supported their absurd assertions by the reports of some of our well known "professors," in order that they might defeat the introduction and competition of cheap water gas, having in a great measure succeeded in this object, quietly themselves commenced the manufacture and distribution of the "deadly water gas" that they had so long denounced. There are few people, says the *Engineering and Mining Journal*, probably who know the progress made in the introduction of water gas in the past ten years. Most of the Pennsylvania cities, Baltimore, New York, and several of our other large Eastern cities are now lighted to a great extent with an enriched water gas; but the present enormous consumption will sink into insignificance when the cheap unenriched water gas is distributed for fuel. The success of the new incandescent fuel gas light, to which we have already made references in these columns, promises to bring about this change soon. We may then expect to see our gas, costing consumers say 50 cents per thousand feet, used generally for fuel, and at the same time furnishing a much better light than we now have. Of all investments now before the public, gas making appears to be the most profitable and the least liable to loss.

Progress in Marine Steam Engineering.

As regards progress in marine engineering, there is no doubt, says *Engineering*, but that the leading fact of the past year is the decided step forward which has been made by the triple expansion engine. It is but right that we should take notice of the progress that is now showing itself. The triple expansion system was adopted last year in the Australasian by Messrs. Robert Napier & Sons, whose engineer partner, Mr. A. C. Kirk, was the first person on the Clyde to give practical shape to the principle of triple expansion in marine engines. In his hands a steam pressure of 125 pounds per square inch was adopted in the Aberdeen, of which the Australasian may be said to be a sister ship. The same system was also adopted by the same firm in the Mexican steamers which they built and fitted out. Messrs. Rankin & Blackmore, in the early part of last year, resolved on adopting a steam pressure of 150 pounds per square inch in the patent triple expansion twin screw engines which they constructed for the steamer Arabian—four cylinders being employed for the purpose.

In the case of the Shaw-Savill and Albion companies' two splendid steamers built last year by Messrs. William Denny & Brothers, and engined by Messrs. Denny & Co., a steam pressure of 160 pounds per square inch was adopted. Such a forward step showed that Mr. Walter Brock, of the last named firm, had great faith in the system of triple expansion; and the results attained by the Arawa, the first of those two steamers, abundantly show that his faith was well founded. That vessel has at sea done 13 knots an hour on a consumption of 50 tons of coal per 24 hours, from which fact it is quite evident that large ocean steamers need not, to such an extent as hitherto, be floating coal pits rather than profitable cargo carriers. Incidentally, we may mention that the consumption of fuel in the steamer Arabian, already alluded to, has been brought down to the very low rate of about 1½ pounds per indicated horse power per hour. So far as we remember, no lower rate of consumption has been got with any of the splendid engines turned out by Messrs. Elder & Co.; certainly there was no advance made in that direction last year over the results attained in the preceding year. In the early future, however, we may expect to hear of further progress, inasmuch as Messrs. Elder & Co. are now engaged in the construction of triple expansion engines for the steamers Parthia and Batavia, lately belonging to the Cunard Company. In the case of these new engines, we understand that a steam pressure of 150 pounds per square inch is to be adopted whereas the highest steam pressure yet resorted to in any engines constructed at Fairfield has not exceeded 110 pounds per square inch.

There are at present in hand, or projected, something like twenty steamers in which there is every probability that triple expansion engines will be adopted, with working steam pressures ranging from 135 pounds to 160 pounds per square inch. We have mentioned the Parthia and Batavia, the engines of which are well nigh completed. Messrs. Caird & Co. have in hand a new steamer for the P. & O. Company in which triple expansion engines are to be fitted. Messrs. Alexander Stephen & Sons are engaged on four steamers regarding which the same may be said, a working pressure of 160 pounds having been adopted in this case. That is also true of five steamers which Messrs. Denny & Brothers have in hand, chiefly if not wholly for the British India and New Zealand lines. Messrs. D. & W. Henderson & Co. have in hand three steamers in which triple expansion engines are to be adopted, one of them being a magnificent yacht for Mr. Clark, of Paisley, and in which a working steam pressure of 135 pounds is to be employed. Messrs. A. & J. Inglis have in course of construction a steamer for the Clyde and Dublin passenger and cargo trade, whose engines are to be of the kind under notice. Of the cases in which such engines are spoken of as being probable, we need not speak any further. Quadruple expansion is also regarded as one of the possibilities, and even as one of the probabilities, of the early future of marine engineering.

It does not appear that in ordinary compound engines, even of the three cylinder type, higher working pressures than 110 pounds have yet been adopted on the Clyde. That is the pressure reached by Messrs. Elder & Co. in the Umbria and Etruria, and it is the pressure employed by Messrs. J. & J. Thomson in the two Channel paddle steamers already spoken of; and doubtless other instances of the same pressure could be adopted. We have heard it stated, however, that the engines for the Admiralty steamer Scout, which Messrs. James & George Thomson have in hand, are to be worked with steam of 120 pounds pressure; but that is a matter that may be referred to on another occasion.

Intimately connected with the question of steam pressure is that of the material of which the boilers are constructed. No material change has taken place in recent years in respect of the form of boiler which is in such common use, but the constructive material employed has undergone a most complete change. So far as Clyde practice is concerned, it may be said that a marine boiler now being made of iron is quite a novelty, steel being employed almost universally. For boilers of the largest sizes, and involving such high steam pressures as we have been speaking of, very thick plates, even up to 1¼ inches and 1⅜ inches, are now in request, and the steel makers are turning out plates of such large areas that they not unfrequently weigh up to, or upward of, two tons. The material is produced of very high quality and at a very low price in Scotland, and almost at the very doors of the users, and hence the employment of it among Clyde marine engineers has progressed with most astonishing rapidity. The experience gained with it is of such a character that the utmost confidence is entertained on almost all hands regarding it. In cases where it has been used over periods ranging from five to seven years in fire boxes and combustion chambers, the ordinary wear and tear and lamination, so well known where iron is used for the same purposes, are not, as a rule, to be seen. For a time at first, engineers would not universally trust to the use of steel rivets in boiler making, but the opposite is now the rule, as the use of iron rivets in steel boilers is about as great a rarity as a new iron boiler. Of course, the question of hand riveting *versus* machine riveting now comes in for consideration, and we are glad to know that riveting machines are getting more and more extensively into use.

London Automatic Post Offices.

A London paper describes a novel plan for supplying stationery to railway passengers. In nearly every railway station is a small box on legs, painted crimson, which may be called an automatic post office. It is divided in two compartments. On the top are apertures admitting a penny, one being for postal cards and the other for envelopes. You drop a penny through the slot and open a little drawer beneath, and presto! you find a postal card. Drop two pennies in the right hand slot, open a corresponding drawer, and you find a stamped envelope containing a dainty sheet of note paper. These little conveniences are the property of a company (limited, of course). The profit must be very small, and only on the envelope and sheet of note paper. It may consist in its conveniently getting out of order occasionally and refusing to deliver; your penny has gone in and cannot be got out, and there is no satisfaction to be had by objurgating the box. You can't get the best of it by dropping in a bad penny, as if not full weight it refuses to deliver, and keeps your short coin, confiscating that as a punishment for your attempt to cheat. It has a golden rule that works only one way.

Surgery of Dynamite.

The medical faculty have recently given some little attention to what they are pleased to call "Surgery of Dynamite," by which is meant the effect of dynamite explosions upon those in their immediate vicinity. It is interesting to learn from these discussions that the jar or shock which the system receives differs altogether from that which is the result of a blow upon the head or body, or resulting from railway collisions. These latter follow a comparatively well-localized and gross form of violence, whereas the shock coming from a dynamite explosion is diffused and divided.

In the case of the two young women who were injured by the recent explosion in the Tower of London, neither suffered from contusions, nor did they bear any marks of wounds save a few scratches received from falling upon a pile of rubbish. The sensation they experienced was not that of being violently knocked down, but of being "pushed back." Both suffered from severe pain along the right inferior dental and auriculo-temporal nerves, and a profuse catarrh showed the meatus had been injured. Cole, the policeman, suffered from no complication through a fracture of his ribs, but, as in the case of the young women, his chief ailment came from a general enfeebling of nerve function, which caused a depression in the heart's action and a temporary loss of sight and hearing.

THE NEW ORLEANS EXPOSITION.

(*Continued from first page*).

the other machine the difference was only about 25 degrees. One of the ingredients of the piston packing rings is graphite, the effect of which, in combination with the circulation of the water in contact with the cylinder walls, is a very perfect automatic lubrication.

The large bearing surfaces, the heavy and well distributed framing, and the efficient method of cooling allow these compressors to be driven at more than ordinary speed and at the same time secure economical results.

The "pony pattern" air compressor requires but a slight foundation, since it is self-contained in the manner of direct-acting steam pumps. The upper crosshead guide is cast solid with the frame, thus placing a liberal proportion of metal above the center line of the cylinders, and taking the working strains in direct pull and thrust. This obviates the necessity for the deep box which has been customary with this style of machine, and makes it practicable to support it at each end only, and also prevents any springing or bending due to bolting a long bed to an irregular surface. The piston rods and crosshead are of steel, the crank pins, pins and links of valve connections are of mild steel, casehardened, and all the brasses are of phosphor-bronze. The valves are of the poppet type, giving a minimum of waste room in the ends of the cylinder, which is provided with a water jacket. The inlet valves are similar to those described above. The bearing surfaces are all large, and the machine is well made throughout.

Although we have mentioned but two of the air compressors, we have given enough to acquaint the reader with the principal characteristics regarding the construction and operation of the machines manufactured by this firm.

The rock drills shown in the engraving belong to the class known as "striking drills," in which the drill steel is an extension of the piston rod. The cylinder slides in a guide or shell, mounted upon a tripod formed with a universal joint, and is fed toward the rock as fast as the steel penetrates it. A positive motion valve insures certain operation when steam or air is admitted, without depending upon close fits or clean parts; it allows of a variation between the up and down stroke, thereby saving steam and increasing the working capacity of the drill. The valve is moved in the same direction as the piston. The rotating bar is made full size where it enters the ratchet, and it is claimed that it never breaks. The piston rod and chuck are made small and solid outside of the cylinder, whereby greater lifting power is obtained. The throttle is placed on the steam chest, where it cannot be lost or injured in handling. The coupling has no gaskets that can drop out, and provides for instantaneous connection of the hose without the use of a wrench or spanner.

The length of stroke of a rock drill is uncertain, since, as the hole progresses in depth, the cylinder must be correspondingly fed forward, but to effect this feed with perfect regularity is impossible. In these drills provision has been made for this irregular feed and length of stroke, but nevertheless, when full strokes are made, the valve does not move nor is steam admitted below the piston until the actual delivery of the blow. The result is that while in cushioned drills the blow struck is that due to the difference between the action of the driving steam and of the cushioned steam, in this drill the blow is that due to the full, unobstructed action of the driving steam.

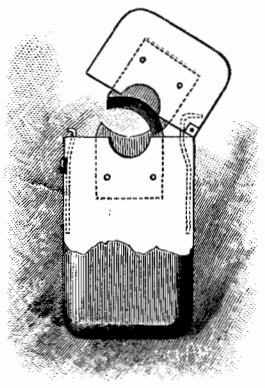
In the adjustable tripod both front legs are so arranged that they can be set at any angle or placed in any desired position. The movement of the legs is not limited to a small area, but they can be pointed toward the side, front, or rear, raised at right angle to the drill rod, or pointed straight upward in an opposite direction to that in which the rock is to be bored. This arrangement is particularly useful in drilling "lifting holes," and where it is desirable to drill a hole close to the side of a cut, or in bench work in mines. In the iron mines of Lake Superior, where many of these drills are at work, the miners are often called upon to commence drill work 40 feet or more from the floor of the chamber. A ladder is set up against the side of the mine, the miner climbs to the place to be drilled, lowers a rope, and with the help of his mate pulls the drill up after him. He chips out of the rock a spot large enough for the rear leg and one for one of the front legs of the tripod, the other front leg being tied to the ladder. The hose being connected, four or five holes are drilled in the solid ore, iron bars are placed in the holes, and across the projecting ends of these bars planks are laid and a stage constructed from which drilling and blasting in the regular way are soon carried on.

Two or more of these drills (without the tripod) may be mounted upon arms projecting from shifting sleeves placed upon a swivel jointed bar which may be held between the walls of a shaft or the floor and ceiling of a gallery. The bar is firmly held. and is not loosened by the jar of the drills while running. The drills can be moved along the bar to any position, and can be worked at any angle. A quarry bar is used to carry drills for channeling, gadding, etc. It can be set at any angle, and with it holes can be drilled true and in line.

It has always been the aim of the Rand Drill Company, in all of the appliances made by them, to design the machines in accordance with both the theory and practice, to employ the best material and so distribute it as to obtain ample strength without unnecessary weight, and to insure economy and effectiveness in operation and great durability.

COMBINED CIGAR-CUTTER AND MATCH BOX.

The convenient little device herewith illustrated was recently patented by Mr. H. B. Eggert, of Bethlehem, Pa. The body of the box, made of sheet metal, is provided with a spring hinged lid, which is thrown open when released by pressing on a front button catch. Secured within the box on the one side of the body, and corresponding side of the lid, are two concave steel cutters, which project beyond the meeting edges of the body and lid, so that in closing the lid one cutter slides, as the blade of a shears, over the other. An opening is formed by notching the meeting edges of the lid and body of the box at the point where the cutters are located, the object of this being to prevent the end of the cigar from being crushed, as it would be if the meeting edges were straight. The arrangement of the cutters within the box prevents the cutting blades from catching on the lining of the pocket in which the box is carried.



Curing Herring.

In Mr. Perley's Report of the Fisheries in the Bay of Fundy, the manner of curing herring is thus described:

The fish are scaled by being washed in bushel baskets with a square bottom, open like a coarse sieve, the men standing in the water up to their knees. The best fish have very few scales, and only half a bushel of them are taken in the basket at once; they are then salted in large tubs, the salt being stirred through them by hand; the quantity used is half a bushel of salt to two and a half barrels of fish, which are a tub full. They lie in salt twenty-four hours, and are then washed in fresh water to prevent their becoming "salt burnt," after which they are strung on rods, with their heads all one way, and then hung up in the smoke house. In Clements the smoke houses are usually 30 feet square, with 14 foot posts and a high roof; no fish hang nearer the fire than 7 feet, but the most careful curers do not hang them nearer than 8 feet. Rock maple is used in smoking; when it cannot be procured ash is used, being considered next best. The process of smoking usually occupies eight weeks; and it requires the whole time of one person to watch the fire and to attend to the smoking, in which much judgment and great care are required. The smoke is usually made up at nightfall, unless the weather is warm and wet, during which time no fires are made. In fine weather the smoke houses are thrown open during the day to cool; and the greatest care is taken at all times to keep down heat, and to render the smoke house as cool as possible by numerous windows and openings. After being smoked, the fish are packed in boxes 18 inches long, 10 inches wide, and 8 inches deep, measured on the inside; and there should be 24 dozen fish in a box of prime herring. If the fish are large and of the best quality, it requires some pressure to get this number into a box. The Digby herring are in some instances cured in pickle, unsmoked, and packed in half barrels.

The Air and the Telescope.

The air we breathe is, in truth, the worst enemy of the astronomer's observations. It is his enemy in two ways. Part of the light which brings its wonderful, evanescent messages across inconceivable depths of space it stops; and when it does not stop, it shatters. And this even when it is most transparent and seemingly still; when mist veils are withdrawn, and no clouds curtain the sky.

Moreover, the evil grows with the power of the instrument. Atmospheric troubles are magnified neither more nor less than the objects viewed across them. Thus Lord Rosse's giant reflector possesses—nominally—a magnifying power of 6,000; that is to say, it can reduce the apparent distances of the heavenly bodies to one six-thousandth under their actual amount. The moon, for example, which is in reality separated from the earth's surface by an interval of about 234,000 miles, is shown as if removed only 39 miles. Unfortunately, however, in theory only. Professor Newcomb compares the sight obtained under such circumstances to a glimpse through several yards of running water, and doubts whether our satellite has ever been seen to such advantage as it would be if brought—substantially, not merely optically—within 500 miles of the unassisted eye.

Correspondence.

A Grand Chance for Inventors.

To the Editor of the Scientific American:

Will you kindly permit me to give inventors a hint through your valuable paper? In 1877 I traveled through the Red River Valley on the Northern Pacific Railroad in Dakota. I noticed those large level fields of thousands of acres, which were being plowed or sod broken up by the slow process of a fourteen inch plow drawn by four horses. I thought then that the plow was far behind all other farming implements. I then thought of the ordinary hand plane and the revolving planing machine, and could not see why plowing could not be done on the same principle that a planing machine planes a board. If some inventor will get up a plow to run by steam or horse power, that will cut up the sod into chips like a planing machine cuts the top off a board, and plow about three inches deep, he will confer a great blessing on our Western farmers, as he can then put his field in condition to put in any kind of a crop the first year, and not be hampered for two or three years with long, dry strings of tough sod, which is always in his way in harvesting his crop.

MICHAEL LANG.

Mandan, D. T., March 29, 1885.

Lightships on the Ocean Cable Tracks.

To the Editor of the Scientific American:

As to the suggestion regarding ocean stations along the line of a cable for the purpose of communicating with the land, I would say:

At the meeting of the Ancient and Honorable Artillery Company, September 13, 1880, certain persons, supposed to be experts in all sublunary things, were invited to prepare papers *on the past and present.* These papers were to be sealed up in a box, and preserved until 1980. I was requested to write on commerce and navigation, but I wrote only upon the supposed condition of *the future.* I predicted that small craft would be located on the track of ocean steamers at convenient distances; they were to be fitted with electric lights and means to send messages to the shore; in short, my plan was identical with that above alluded to.

In discussing the practicability of anchoring small craft with steel wire cables, it must be kept in mind that they could not be depended on in waters of more than 500 fathoms, owing to the danger of breaking the wires. Having no chart at hand showing the depth of water on the line of a cable, I cannot say where the stations should be placed.

Consulting Col. Edward Wyman, who was an active member of the Ancients, he says: "Your statement recalls to my mind discussing the very point alluded to; your proposition, in brief, was that vessels could be anchored in mid-ocean at various points on the usual track of ships, and could communicate with passing ships, and transmit by cable to the land any desirable information."

Now, Messrs. Editors, as your sons or grandsons may be here in 1980, I beg you will let them know that I was thinking and writing on the said mode of communicating as far back as September, 1880. I regret that I have not preserved the publication of another writer on the same subject.

I am very truly yours,

R. B. FORBES.

March 31, 1885.

[The probable feasibility of establishing some such means of communication between ships at sea and ports on either side of the Atlantic has long been entertained. In 1876 mention was made in our columns of an invention which had "*revived* the discussion" of the practicability of "establishing telegraph stations in mid-ocean, by which messages could be sent along the line of the cable to terminal points on shore, and *vice versa.*" This particular device was for a hollow sectional column, to be anchored, and with a branch cable to be coupled to the main cable. The great difficulty would be, of course, in making and maintaining a permanent connection with the cable on the floor of the ocean, which through a great part of the length of the Atlantic cable is as much as 2,000 fathoms below the surface.—ED.]

Why Contagious Diseases Attack but Once.

Professor Tyndall thus endeavors to explain the immunity obtained against a second attack of a contagious disease: "One of the most extraordinary and unaccountable experiences in medicine was the immunity secured by a single attack of a communicable disease against future attacks of the same malady. Smallpox, typhoid, or scarlatina, for example, was found as a general rule to occur only once in a lifetime of the individual, the successful passage through the disorder apparently rendering the body invulnerable. Reasoning from analogy, I have ventured to express the opinion that the rarity of second attacks of communicable disease was due to the removal from the system, by the first parasitic crop, of some ingredient necessary to the growth and propagation of the parasite."—*Medical World.*

New Refrigerating Machine.

In refrigerating machines, up to the present time, there has been utilized as the sole source of cold the passage of liquid to the gaseous state without the intervention of any chemical phenomenon. The various systems of such machines differ merely in the absolute tension of the vapors on both sides of the compressing piston, and in details of arrangement. Instead of a single liquid, M. Pictet proposes to use a volatile liquid which may be split up into two or more volatile liquids by the mere fact of a fall of temperature. He has oxidized carbonic acid by associating it with sulphur oxide, and has obtained a series of compounds from $C_{40}O_{82}S$, boiling at —71°, to $CO_{16}H_7$, boiling at —7·5°. The more the temperature sinks, the more the original liquid is resolved into elementary volatile liquids, each giving off vapors.

The sum of all these elementary tensions is much more considerable than that which would correspond to a single permanent liquid. At higher temperatures all these liquids recombine into one, and the maximum tension of the vapors is considerably reduced under the influences of the affinities developed. If we introduce into a refrigerating machine the new volatile liquid SCO_4, the vapor tension in the refrigerant will be very much superior to that of pure sulphurous acid, while the tension on compression in the condenser, where the vapors resume the liquid state, will be decidedly less than that of sulphurous acid. The compressing piston will thus receive a stronger pressure in aspiration, but a smaller one in compression, thus effecting a great economy in the force required for working the pump.

COMPOUND OPTOMETER FOR CORRECTING ERRORS OF REFRACTION.

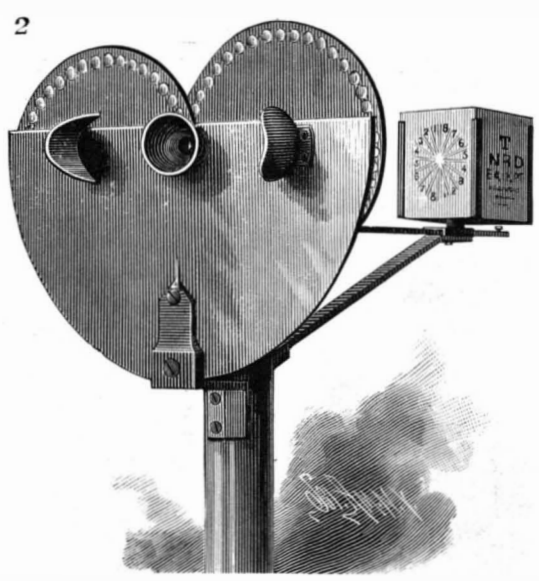
In making examinations of the eye for the purpose of determining its refraction and the adaptation of spectacles to correct defects which may exist, the first part of the process is to determine visual acuteness. Letters are placed before the individual whose eye is being examined, of varying sizes; some to be seen by the normal eye under a visual angle of 5′ at 200 feet, and from that down to the distance at which the letters are from the observer. In order that the refraction of the eye be correctly measured, it must be in a state of rest—adjusted for parallel rays; and this ophthalmologists claim can only be secured by placing objects to be observed at a distance, and 20 feet has been accepted as the distance which practically accomplishes this object. But it is claimed that the optometer herewith illustrated renders rays emanating from objects placed at 13 inches from the eye parallel, and consequently measures the refraction perfectly. Lack of visual acuteness may be due to a defect in the perceptive part of the eye, the retina, or to a refractive anomaly. To determine this a concave and a convex lens, about one-thirtieth, are alternately placed before the eye, and if either improves the vision there is either myopia or hypermetropia. The number of the glass that produces the greatest visual acuteness measures the refractive error. If neither the concave nor convex lens increases the visual acuteness, the test for astigmatism is made, and when none of these tests improves vision the defect is in the retina.

This is the procedure followed by oculists, and while being correct theoretically and in its practical results, it is stated to be awkward and tedious when compared with the optometer.

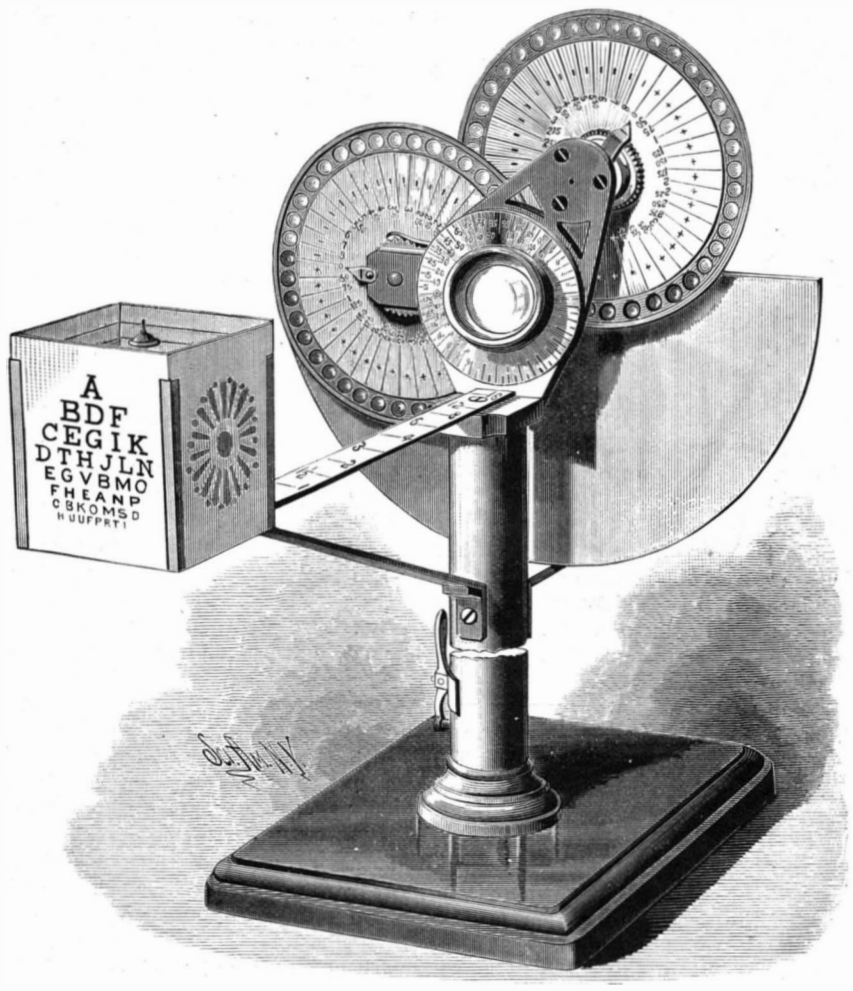
The optometer shown in the accompanying engravings has an upright of about 12 inches, upon which are mounted two circular disks, one for spherical and the other for cylindrical lenses. Each disk can be so revolved that the lenses can be brought in front of a common opening or eye tube, through which the observer sees letters. The disk containing the cylindrical lenses is attached to an arm, by which it has a movement besides the one upon its central axis, and whereby the axes of its cylindrical lenses can be placed in any degree of a circle before the eye tube. The disks are so situated that the lenses of one can be interposed with that of the other, thus combining their effect if necessary. Upon the extremity of a horizontal bar attached to the upright, about 12 inches in length, rests a card rack in which the test letters are placed 13 inches from the observer's eye.

The spherical lenses are 38 in number, 19 concave and 19 convex, embracing a series from $\frac{1}{74}$ to $\frac{1}{4.5}$. Intervening between either extremity of the positive and negative lenses is a plain glass. The disk containing the cylindrical lenses has the same arrangement as the one containing the spherical, as mentioned above. There is an eye piece for the eye being examined, while the other will be deeply shaded, thus practically disposing of the inclination to convergence. The reason for this is that convergence and accommodation are coordinate acts, and in this case by controlling the convergence the tendency to accommodate is also greatly controlled.

At the extremity of the eye tube, and with the center of its system, about 2 inches from the cornea, as it rests in the eye piece, is placed an objective which is a compound achromatic lens, the principal focus of which falls on the test letters on the card. This practically produces a myopia of $\frac{1}{11}$. The rays proceeding from the objective to the eye are of necessity parallel, since the test letters are at the principal focus of the objective. It is claimed that this disposes of the objection to the instrument by those who state that it will not relax accommodation. Placing the objective outside of the anterior focal distance of the dioptric media of the eye magnifies the letters to be observed, but this in no way changes the results of the test for refraction, but the letters used should be proportionately small if a test for visual acuteness be made, else the visual angle of 5′ will be changed; if the letters are magnified one-half, they should be one-half smaller.



BETELING'S COMPOUND OPTOMETER FOR CORRECTING ERRORS OF REFRACTION.



BERTELING'S COMPOUND OPTOMETER FOR CORRECTING ERRORS OF REFRACTION.

In the construction of the system for measuring visual acuteness with this optometer, a letter is used for a basis the measurement of whose diameters forms the base of an angle of 5′, the distance from the center of the system of the objective to the letters forming the sides of the angle. If the eye were placed at 11 inches from the letters, they would be the same size as the objective renders them at 13 inches, so that the visual angle is measured from the center of the system rather than from the position of the cornea. The letter, then, at 11 inches should have a diameter of $\frac{11}{60}$ of a line, or for practical purposes $\frac{1}{5}$ of a line. For the purpose of keeping a record of visual acuteness, as by the method of Snellen, when the smallest letters can be read, which are $\frac{1}{5}$ of a line in diameter, it may be stated that $V=\frac{20}{20}$. When the next letters which are one-half larger are the smallest that can be read, V may be marked $\frac{20}{40}$, and so on up to 200 feet.

This optometer, which is the result of several years of careful study and experiment, has been patented, and is now manufactured, by Mr. L. A. Berteling, of 427 Kearny Street, San Francisco, Cal.

Ornamental Trees.

As soon as the frost has left the ground, loosen the earth around each tree several feet; rake out all the grass and weeds, to prevent turf forming; pulverize the soil thoroughly, to receive and retain moisture; crowd it gently toward the trunk, leaving a small trench around the circumference. This will tend to carry the moisture and nourishment toward the rootlets. Then, if your trees stand in the yard or lawn, you can plant these bare circular spots of ground with any kind of low annuals, such as candy tufts, fumitories, portulaccas, sweet alyssa, pansies, trailing verbenas, etc. Thus you will enlarge your flower space, and the constant cultivation of these flowers will keep the ground about your trees beautiful and in the best growing order. When the season advances, you can mulch with grass or leaves.

Iron Pyrites.

Pyrite, or iron pyrites, is one of the commonest of minerals, occurring in rocks of all geological ages from the oldest granites to the newest slates. It generally occurs in small cubic crystals scattered irregularly through the rocks, but is not uncommon in masses and beds of considerable size. Among the large number of mineral specimens which come to the office of this paper, with the inquiry if they do not contain gold, copper, or some other valuable substance, pyrites comprises the greatest. "Silex," in the *Journal of Commerce* (Boston), gives some interesting facts about pyrites, which is likely to interest considerable of a number of our readers. Pyrites, or sulphide of iron, is composed of about 53 parts sulphur to 47 iron. It is a pale, sometimes bright, yellow mineral, nearly as hard as quartz and about twice as heavy as quartz or granite.

It can be but slightly scratched by the knife, is always opaque, somewhat brittle, and strikes fire readily with steel. The latter circumstance gave rise to its name, which is derived from a Greek word for fire.

Pyrite very commonly occurs in quartz veins with various metallic ores, and is almost invariably found in gold bearing quartz intermingled with the precious metal. Gold not uncommonly occurs disseminated through the pyrite, which is then called auriferous or gold-bearing pyrite. A considerable proportion of the yield of gold is obtained from this variety.

Pyrite is one of the most changeable of minerals, and when exposed to the action of the weather for a length of time, as at the outcrop of a vein, it decomposes, loses its yellow color, and becomes of a rusty iron hue, changing into iron oxide. The rusted honeycombed appearance of much gold-bearing quartz is due to the composition of the pyrite. This liability to decomposition renders all rocks containing much of this mineral unfit for building purposes where beauty and durability are desired. The yellow color of pyrite has often led people to mistake it for gold, and a great deal of money has at one time and another been wasted in mining fool's gold, as it is often called, in the belief that it was the precious metal. Gold is very easily distinguished from pyrite, the only resemblance being in the color. Gold is a soft mineral, easily cut by a knife, is of a deep yellow color, and is nearly five times heavier than pyrite. However, as a small proportion of gold is often present in pyrite, it is always well to ascertain by analysis if enough gold is there to pay for working.

Though pyrite contains nearly 50 p. c. of iron, it is never worked for this metal, as it can be obtained much more cheaply and easily from other ores. Sulphur is sometimes obtained from the mineral, but its principal uses are in the manufacture of copperas and sulphuric acid. It has not been mined to any great extent in this country, as yet, for these purposes, though largely used in England. Though pyrite occurs almost everywhere, there are some localities that afford unusually fine specimens, as Waterville, Me., Rowe, Mass., and Roxbury, Conn., in New England. Fine specimens of crystallized pyrite are found in many places in the Middle and Western States, and especially in Colorado.

Amateur Photography.

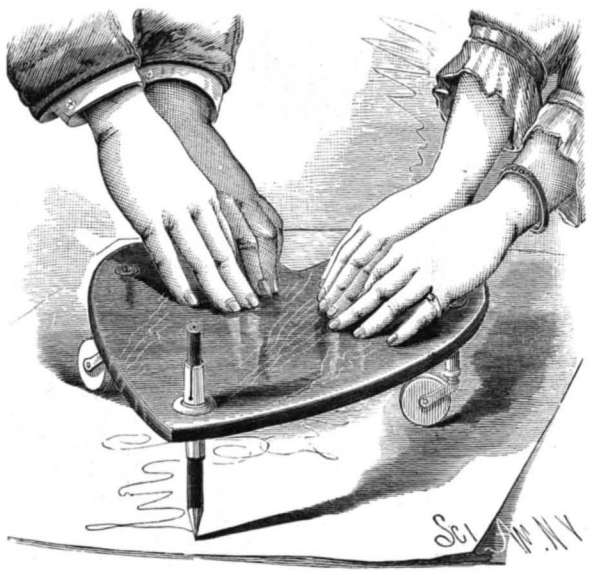
With the recent improvements in materials and apparatus for photographing, there has come a great accession to the ranks of those who, in all parts of the country, find in this interesting study a pleasurable, inexpensive, and sometimes lucrative employment. As is the case, however, in almost every wide-embracing field of activity, there is no noticeable success attained except by those who make diligent and intelligent application, and this is particularly true with the large number of amateur photographers, who find it so easy to learn the principal elements of what is necessary to make sun pictures before they realize how important it is to have also some artistic taste and education, and learn the nicety of manipulation required in a thousand delicate details which the successful photographer must carefully attend to. This is abundantly indicated in the discussions which take place before the numerous societies of amateur photographers, now springing up in all sections; but the genuine pleasure to be got out of a little patient application in this field, and at very slight expense, appears to be sufficient to insure its steadily growing popularity. One of the leading societies of this kind, that of the Amateur Photographers of New York, is noticed at length in a recent number of *Anthony's Photographic Bulletin*, with a photograph of the President, Mr. F. C. Beach, from a negative made with the electric light. Mr. Beach commenced making pictures as an amateur photographer in 1864, when only sixteen years of age, and has continued to do so ever since, so there seems to be an especial fitness in his occupying the position of first President of the Society of Amateur Photographers of New York. Mr. Beach has himself invented some and improved many of the old processes in photography, and being something of an enthusiast in this line, it is not strange that the society of which he is the head should at once have taken a leading position.

PLANCHETTE.

Planchette is now very seldom met with, and so many questions are constantly sent to the office of this paper concerning it, that we reproduce herewith an illustration of one which appeared in the SCIENTIFIC AMERICAN in 1868.

Many think that there is some hidden secret in the construction of planchette. This, however, is a mistake, as all that is necessary is that the parts should be nicely joined, and that it should stand firmly and move readily on its legs. Any one with ordinary mechanical skill can put one together, and the accompanying cut shows clearly all that is necessary—a heart-shaped cedar board, with two nicely turned metal legs, carrying well lubricated casters, the point of the board having an aperture of suitable size for the insertion of a lead pencil, which serves as the third leg and rests on the paper. It is not to be supposed that planchette will yield at once to the influence, for it is very willful, and often, when it does begin to move, simply speeds across the paper, scribbling incoherences. One of the most extraordinary traits of planchette, however, is the way in which it will persist in writing repeatedly a meaningless reply, until suddenly the humor will seize it, and it will write a coherent word or sentence. Planchette first made its appearance in 1867, and was by no means slow in attracting almost universal attention. The pranks that it was made to play were so many and curious, and its ways so mysterious, that not only did it become the nightmare of the superstitious, but it afforded amusement in many a household. It became also the subject of investigation by some scientists. Marvelous tales were told by the credulous about it, and planchette often told curious tales about itself. Even as distinguished scientists as Prof. Tyndall and Prof. Faraday were drawn into controversies concerning it.

Many believed that humbug was stamped over every movement of planchette, and that one or the other of those whose hands bore upon it always conspired with the little board in the formulation of its replies; but when it became evident that planchette would write coherent answers while under the influence of those who were in ignorance of the replies that were expected, it became necessary to explain the phenomenon on some other basis. Whether this has ever been satisfactorily answered is in the minds of some still a question. Certain it is that planchette has performed some curious feats, and has made for itself a position in the world of mysteries. Probably the most generally accepted explanation is that advanced by Lewes and others, that although there is no intentional movement of the hands of those who are subjecting planchette to the influence, still there is, in spite of this, an unconscious pressure of the finger tips upon the board, which directs the movement of the pencil. Nor does it seem that such can be at all unlikely, for unconscious movement is by no means an unusual phase of our existence. The somnambulist who nightly takes a promenade from cellar to garret, or whose steps by chance have led him to the border of a precipice, has as little knowledge of the peril he has escaped when the morning beams have awaked him as planchette is conscious of its movements. How often also in mercantile pursuits do those who are accustomed to a certain routine perform it unconsciously, and after the work has been finished would be unable to tell you of many of the details of the work which custom has taught them to perform correctly, even while in a state of abstraction. Much has been said at times of planchette's prophetic nature. Under the influence of certain people of a highly nervous temperament, or having to a certain extent the qualities of mediums, future events are said to be foretold. Secrets of which the person touching planchette is in ignorance have been divulged in a remarkable way, and many anecdotes draping planchette in mystery are repeated and believed. Were the testimony, however, more universal, were planchette more consistent, and were it more generally truthful and less given to uttering remarkable sayings only occasionally, there would be more reason for according it a place for thorough and systematic investigation. Perhaps the day will come when mesmerism is understood and mind reading is more satisfactorily explained, that there will be occasion for looking upon planchette more seriously, and of regarding it as a wonderful means of displaying a rational nervous action independent of conscious mental cerebration.



PLANCHETTE.

THE BIRD SPIDER.

Few animals are more repulsive than the gigantic spider which we figure herewith, of natural size. The bird spider (*Mygale avicularia*), for so the creature is called, excites horror in all the countries in which it is found.

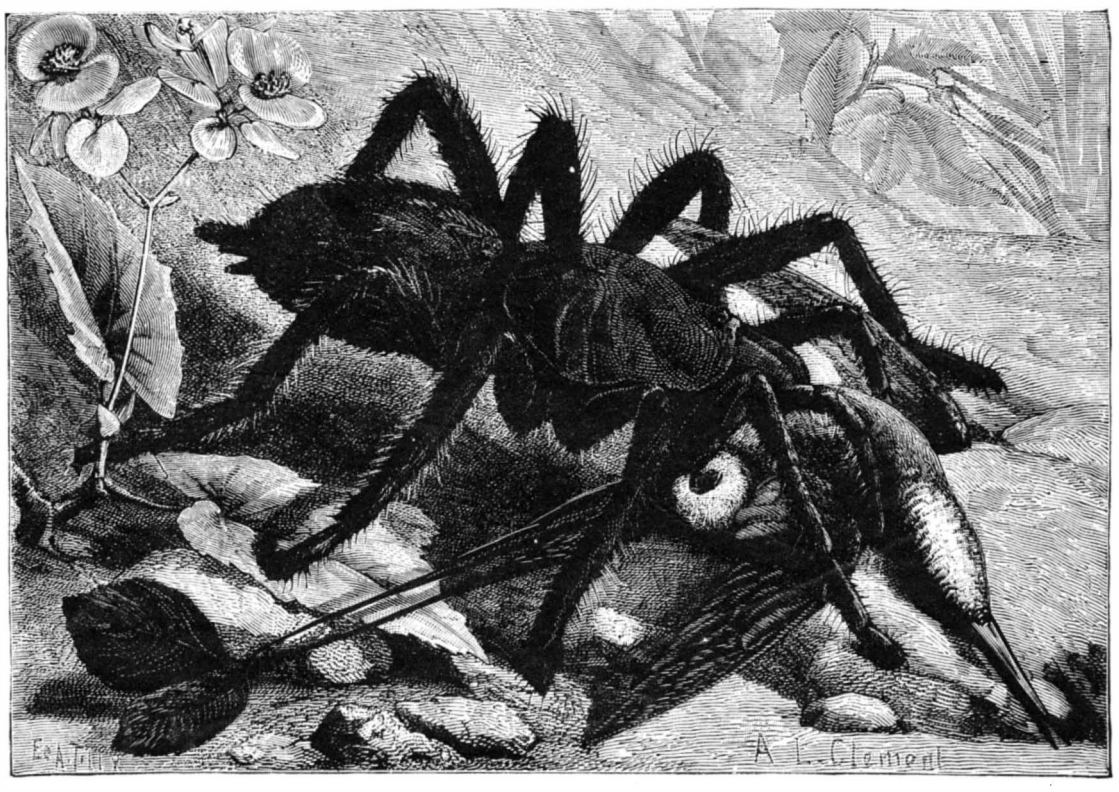
In the Antilles and in the forests of Venezuela, Brazil, Guiana, and Ecuador, its repulsive aspect has, among the residents, as well as among travelers, caused a terror that the imagination of the aborigines has still further exaggerated. How many times, while lying in my hammock during the long equinoctial nights, have I heard the Indians and peons, while squatting around the camp fire in the virgin forest, tell each other stories, or fables rather, whose inexhaustible theme was serpents, bats, and big spiders! In measure as the night advanced, the tales became more and more extraordinary. From hecatombs of birds devoured upon their nests by the *Arana cangrejo* (crab spider), with long velvety legs and poisonous jaws, the orator passed to more dramatic facts, and the last flickerings of the dying embers often lent their fantastic accompaniment to a story about a child whose blood had been sucked while it lay in its cradle!

Freed from these local exaggerations, which are so frequent among these weak minds in a state of nature (and examples of which might be easily found nearer home), the history of the bird spider still remains sufficiently interesting to merit being narrated and be better known.

Linne described this species under the name of *Aranea avicularia*, the specific name recalling the animal's habit of feeding at times upon young birds, and even upon adult humming birds, captured upon the nest. The celebrated entomologist Latreille in 1802 established the genus *Mygale* for Arachnids of the tribe Theraphoses. All the individuals included in this group are hunters, and live either in nests constructed in the earth or in the clefts of stones and under the bark of trees, like the species that forms the subject of this article. Some of them are wonderfully skilled workmen, as the mason spider (*M. cœmentaria*, Latr.), of southern France and the pioneer spider (*M. fodiens*, Walck.) of Corsica.

The habits of the bird spider are not so well known as those of the ones just mentioned, either because from its hunting being done at night it is rarely met with, or because it selects retreats that are not very accessible. There are few authors to be found, however, who have correctly spoken of this curious and dreaded spider; several of them have copied one another, and others have devoted themselves especially to its anatomy. During the course of my travels in equinoctial America I have several times had an opportunity of seeing the bird spider in a state of nature, and it will perhaps be permitted me to add a few personal observations to those of the travelers who have preceded me.

Of the several hundreds of spiders that have been described, this is the largest. The largest specimen that I captured (the one that served for making the annexed portrait) measured exactly, with legs stretched out, 7 inches in diameter. The first one I saw was at Martinique, not far from Saint Pierre, in the trees skirting a road. Its nest was suspended from the branch of a *Palicourea*, an elegant shrub of the Rubiaceæ, and its appearance strikingly recalled those large caterpillar nests that we so frequently find upon the Aleppo pine (*Pinus halepensis*) on the mountains in the vicinity of Cannes and Nice. It consisted of a beautiful white silken tissue, of several thick layers, strengthened by very strong threads capable of arresting a small bird. In the center were placed the eggs, perhaps 1,500 or 2,000 in number. As soon as the young are hatched and escape from the cocoon, large red ants of the genus *Myrmica* wage a bloody war on them, and feast upon their whitish flesh of no consistency and without hairs. Such destruction happily counterbalances the ravages that the spider would make were it to multiply too abundantly. In fact, the adult animal, whose body measures no less than 4¼ inches in length, not including the legs, is as ferocious as its aspect implies. Its entire body bristles with long reddish brown hairs. Its eyes, eight in number, are strangely grouped upon a small elevation (cephalothorax); six of them are arranged in a triangle on each side, and the two others are separate at the apex of the warty prominence. At the extremity of the strong, black, smooth jaws are the palpi,



THE BIRD SPIDER. (Natural Size.)

shaped like legs, and each terminating in an enormous black shining sting, which is obliquely swollen like that of the scorpion, and, like that, filled with a dangerous venom. These are not its only weapons. At the extremity of its abdomen two elongated glands secrete an abundance of a lactescent, corrosive liquid, which the animal is capable of ejecting against its enemy at will, in order to blind it or render it insensible. Add to this a muscular power so great that it is very difficult to make it let go, even when it has fastened itself to a smooth body, and we shall obtain some idea of the formidable manner in which this species is armed.

It is rare that the bird spider is seen to hunt during the daytime, except near its nest, and principally in dark places; but as soon as night arrives, it leaves its lair. Its wonderful agility, a characteristic which it shares with its congeners, is coupled with rare boldness. It attacks large lizards, like the anolis of the Antilles, and likewise serpents, it is said. These it falls upon as quick as a flash, and seizes by the upper part of the neck, in order to prevent them from resisting. If it surprises a humming bird upon its eggs, it buries its terrible pincers into it between the base of the skull and its first vertebra, injects therein a poison which paralyzes it, and then sucks the blood of its victim at leisure.—*La Nature.*

Live Stock Transportation.

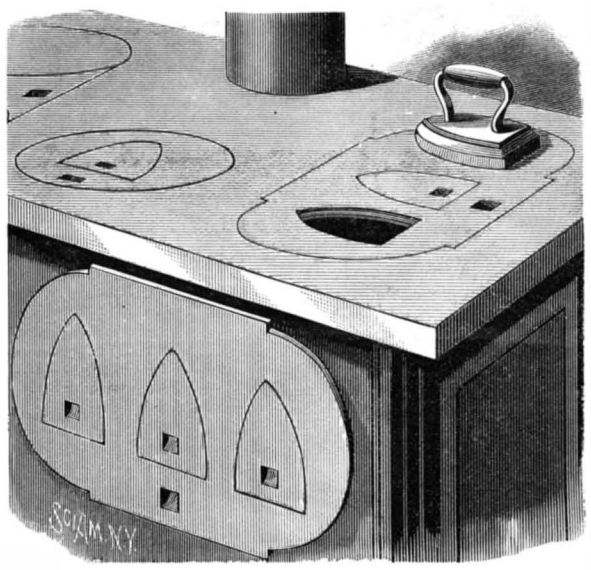
A writer in a recent number of the *Age of Steel*, published in St. Louis, describes from personal observation the cruel treatment to which cattle are subjected while being driven from Texas to Kansas City, and from thence transported by rail to the Eastern seaboard cities. The description, although written apparently in the refrigerator car beef traffic interest, is no doubt substantially true, if, indeed, it does not fall short of the truth in depicting the abuses practiced in live stock transportation. The details need not be recapitulated. It is enough to say that they are revolting to every humane instinct, and a reproach to civilization. It is not alone the barbarities inflicted upon helpless animals to satiate mercenary greed that should attract public attention, but the diseased and unwholesome meats with which our markets are in this way supplied, and to a larger extent than is generally supposed. This concerns everybody, and so far as it exists it is an imposition on the community and a serious detriment to the public health. It is not our purpose, however, to magnify the evils resulting from the rapacity of shippers and carriers in conducting live stock traffic, but to suggest some of the reasons why so little, comparatively, has been accomplished in the way of ameliorating the condition of cattle while in transit over long distances on our railways.

The trouble is not because suitable cars cannot be built, or that cattle cannot be fed, watered, and rested while on their journey; but it results from the necessity of cheapening the cost of transportation by carrying as many cattle as possible in a car, and by continuous running, so as to make the trip in the quickest possible time. This will do very well for short distances that can be made in from 12 to 18 hours, but when cattle are driven long distances to points of shipment, and are then packed into cars to remain there from 50 to 100 hours, with imperfect feeding and no outside rest, the case is very different. If cars could be made so as to give the animals plenty of room to lie down, and at the same time be supplied with feed and water, without increasing the cost of carrying them, it would have been done long ago. "Palace" cattle cars were invented and patented a dozen years ago, with ample provision for making the cattle comfortable and saving them from the protracted misery which they now have to endure. One of these cars was 36 feet long and 9½ wide, which is 10 feet longer and 1 foot wider than stock cars usually are. It would carry 16 cattle of ordinary size and give them plenty of room, but no such cars are running on the roads now, because competition will not admit of it. No road is going to carry cattle in palace cars, packed in as loosely as hyenas and tigers in a traveling menagerie, while a rival road, by prodding and tail twisting, carries twice as many in the same number of cars of the common kind. The best car, from a shipper's and transporter's point of view, is one that will carry the greatest weight of Texas steers to the square foot without killing the steers before reaching their destination.

It is doubtful whether shippers and carriers want any better cars to lessen the miseries of the cattle, unless they will carry more cattle in less space than cars now do, and thus increase the profits of the business. In railway traffic the tendency is to carry more paying weight of all kinds of freight, and live stock is no exception. What is needed to put a stop to the cruelties incident to the transportation of cattle and the slaughtering of sick animals for food that are fit only for fertilizing purposes, is the enforcement of the existing law of Congress, with such additional provisions as may be required; or, in other words, the management and running of cattle trains should be subjected to more strict legal supervision than they now are.—*National Car-Builder.*

NEW TOP FOR COOKING STOVES AND RANGES.

The object of this improved stove top is to secure a more rapid heating of sad irons or other articles of similar character. The use of this improvement, which will be understood from the accompanying engraving, shortens the hours of labor over the ironing board, as the irons are more rapidly heated, while the fire need not be forced to the same extent as when the irons are heated upon the stove top. Time is first lost in heating the top plate to the required temperature, and when so heated, owing to the warping of the tops, the irons are not effectually heated, as unless they rest evenly upon the plate a current of air will be generated between the surfaces of the iron and plate which will carry away a portion of the heat which should have been transferred to the iron. In this improvement the



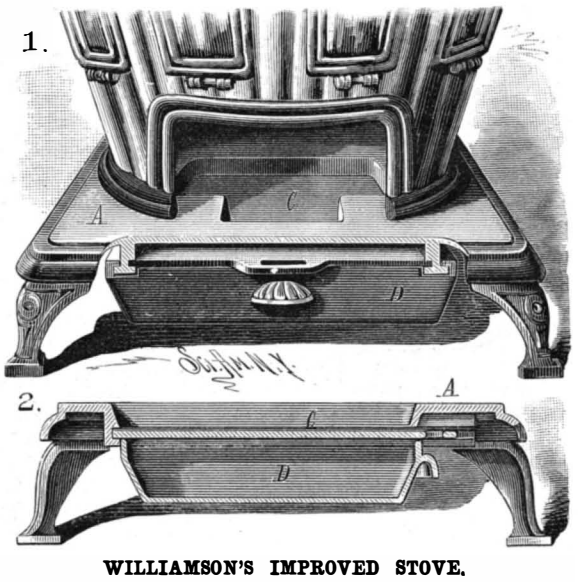
SHAABER'S TOP FOR COOKING STOVES AND RANGES.

plate is perforated in the form of the article to be heated, which rests upon a slight ledge; thus the heat impinges directly upon the exposed surface of the article. The improved cover plate is applicable to stoves already in use, and can be furnished as a separate detail to be used on ironing days.

This invention has been patented by Mr. Jacob Shaaber, of 825 Chestnut Street, Reading, Pa. We are informed that two extensive stove manufacturers of Reading are now getting ready to introduce it with their stoves.

IMPROVED STOVE.

The bottom plate, A, of the stove has a central opening, and has cast on its lower surface inverted T-shaped flanges on opposite sides of the opening. In the grooves thus formed move the sliding cut-off plate, C, and the ashpan, D, the side edges of which are bent in order to enter the outside grooves. Below the opening and back of its rear margin a stop bar is cast on the plate, to receive within it the back edge of the sliding plate; this bar is made sufficiently deep to also act as a stop to the ashpan. This fit of the sliding plate makes



WILLIAMSON'S IMPROVED STOVE.

a close undercover to the opening to prevent the escape of cinders, dust, or ashes when the ashpan is withdrawn. The pan is provided with a front handle, by which to move it, and the plate is also formed with a handle or loop piece arranged out of the way of the pan, to admit of the movement of the slide in or out without interfering with the pan. After the ashes have been dumped into the pan, the plate may be closed and the pan be removed subsequently at any time, without producing dust in the apartment and without risk of ashes or cinders falling from the stove to the floor.

This invention—patented by Mrs. Sarah A. H. Williamson, of Carson City, Nev.—is applicable to ranges as well as stoves, and when a grate is used for burning coal.

The Medical View of Roller Skating.

It seems as if America were peculiarly susceptible to epidemic influences of a mental kind. We hear of no other country so violently perturbed by "waves" of temperance crusading, religious revivals, velocipede crazes, pedestrianism, and, finally, roller skating, upon which latter pastime the thoughts and feelings of three-fourths of the rising generation are at present centered. In intensity and extent, the roller skating mania has far exceeded all its predecessors, and it must be inferred, either that the psychological contagium is particularly strong, or that the susceptibility of young America to affective epidemic influences is increasing.

Modern scientists of the "Psychical Research" school are putting forward the theory of brain waves as a possibly potent element in the production of panic fears and epidemic fashions and feelings. The mind acts "exoneurally," we are told, and the vibrating brain cells of the enthusiastic roller skater communicate their rhythmical pulsations to the previously insensitive spectator. Whatever the mechanism, there is certainly at present a morbidly exaggerated passion for, and indulgence in, roller skating. And the question comes home to the physician, whether it is doing any physical or mental harm.

On the whole, we are inclined to take a rather lenient view of the present craze. Considerable inquiry has failed to elicit any facts showing that roller skating, temperately indulged in, does any harm to growing children, or produces any diseases and injuries peculiar to the sport. Severe sicknesses have been known to result from violent exercise in hot, ill-ventilated rinks, and occasionally serious injuries are produced by falls and collisions. In proportion to the immense number of persons who have been engaged in propulsive divagations upon polished floors during the past winter, the pathological outcome has been small.—*The Medical Record.*

The Recent Earthquakes in Spain.

A number of interesting physical observations have been made on the recent earthquakes in Andalusia and the Azores. The shocks near Malago varied in destructive effects, according to the nature of the ground, says *Engineering;* buildings founded on sand at the borders of the Mediterranean Sea suffered in general less injury than houses built on rocks and at a higher level. The first shock was felt about 9 P.M. on December 25, 1884, the tremors being very violent and lasting, as well as exceedingly rapid. Then there was a stoppage for two or three seconds, followed by a trembling stronger and more rapid than before. Fortunately this did not last long, else every building would have been destroyed. During the night of the 25th of December, the shocks were continued from time to time at intervals of from 45 minutes to 80 minutes, and varied in strength, but were mostly feeble as compared with the first shocks.

Further shocks were felt until January 1, 1885, more of them occurring by night than by day, and the nocturnal ones being stronger than those of the day. The shocks were felt at Madrid, but they were feeble there. In fact, the severe shocks were felt over a belt of country bordering the Mediterranean, and 90 to 120 miles broad. By means of a large vessel of water, M. Germain observed that the shocks, except one, took place round an axis parallel to the borders of the sea, and cutting the north and south line at an angle of 74 degrees on the east side of the latter. Each shock was accompanied by a roaring sound like that of a distant storm; but the sea remained calm as usual.

Another observer states that great rocks were rolled down the slopes of the Sierra Alhama, and the captains of the vessels, the Isabel, bound for New York, and the Clementine, for Valencia, report that the earthquake was felt at sea by the Isabel in longitude 28° 51′ W., latitude 29° 55′ N.; and on December 18 by the Clementine, in longitude 12° 30′ W., and latitude 33° N., off San Fernando on December 23. Moreover, shocks were felt at Terceira, in the Azores Islands, at 2:30 A.M. on the 22d of December, but without doing any damage.

Teaching the Deaf to Talk.

Mr. N. F. Whipple, principal of the Oral School of Deaf Mutes, at Mystic, Conn., recently explained in the Plymouth lecture room, Brooklyn, the system of teaching articulation to the deaf and dumb. He introduced on the platform a boy who had been deaf from his birth, and who repeated the Lord's Prayer loud enough to be heard in the rear of the room. The boy spoke with much distinctness. Long and difficult words suggested by the audience were promptly interpreted by another deaf boy as they fell from Mr. Whipple's lips.

Enoch Whipple, over sixty years of age, who was the first deaf mute taught to speak in this country, read a chapter from Jeremiah, and related how in early childhood he had learned the power of speech from watching the movements of his father's lips.

As a test of the length to which the system has been carried, Mr. Whipple had the lights lowered and had a deaf boy interpret his utterances by watching the shadows made on the wall by his lips.

ENGINEERING INVENTIONS

A locomotive has been patented by Mr. Edgar L. Stream, of New Orleans, La. This invention covers a special construction to adapt the driving wheels of a locomotive to be weighted by the draught of the train, in order to increase its adhesive and tract ive power.

A metallic railroad tie has been patented by Mr. Charles H. Van Orden, of Catskill, N. Y. It is made of wrought or cast iron, and of considerable width, to prevent it from being pressed down into the roadbed, while it has a rib along its under surface which strengthens the tie and enters the roadbed to prevent all lateral movement of the tie.

An alarm coupling for air and steam brakes has been patented by Mr. Cornelius R. Van Ruyven, of Deventer, Netherlands. This improved coupling is so constructed as to indicate by whistling when the cock connected therewith is not open after two vehicles have been connected, and when a coupling is not connected with the dummy coupling, as well as when not attached to the coupling of another vehicle.

AGRICULTURAL INVENTIONS.

A fertilizer distributer has been patented by Mr. Joseph B. Denton, of Newtown, N. Y. This invention covers a novel construction and arrangement of parts in a vehicle to promote convenience and secure uniformity in the distribution of fertilizers.

A broadcast sower, land roller, and double revolving harrow has been patented by Mr. Detlef F. Wegner, of Valley City, Dakota Ter. This invention covers a peculiar construction and arrangement of parts, making an improved machine for sowing seeds, rolling the land after the seeds have been sowed, and then harrowing it, all in one operation.

A pulverizing attachment for plows has been patented by Mr. Junius R. Summerson, of Dublin, Va. This invention covers a special construction and combination of parts whereby the sod is broken up and pulverized as quickly as it is turned over by the plowshare, the device being readily applicable to plows already in use, and one that cannot easily be broken by coming in contact with stones or rocks.

MISCELLANEOUS INVENTIONS.

A coffin has been patented by Mr. Geo. B. Markle, Jr., of Hazleton, Pa. Combined with the coffin lid is a removable face glass, a flexible wire stop for holding the glass in place, and other novel features, so the coffin may without difficulty be temporarily opened.

A gang plank for vessels has been patented by Mr. Lawrence F. Frazee, of Jersey City, N. J. This invention combines hinged side rails with a gang plank, and latch levers for locking them in place when erected, so the gang plank occupies very little space on the vessel or on dock when not in use.

A coin counter and tester has been patented by Mr. William W. Haas, of Farmer City, Ill. This invention covers a novel contrivance of coin balance for weighing and for facilitating the counting of coins of all kinds, in which coin itself can be used as weights or other weights may be substituted therefor.

A feed rack has been patented by Mr. Manly Thomas, of Orlinda, Mo. It is a portable hay rack for feeding horses, cattle, etc., so made as to admit its being readily loaded on an ordinary farm wagon, and then unloaded, wherever it may be needed, by the direct motion of the wagon, in connection with an adjustment of the legs of the rack.

A ventilating chimney has been patented by Mr. Samuel T. Atkin, of Georgetown, Tex. This invention covers special details and combinations of parts with a smoke flue, around which is a ventilating flue, with an adjustable thimble or sleeve, and with which is also a flue stopper which can be used with brick flues, and other novel features.

A shutter worker has been patented by Mr. Leonard Tilton, of Brooklyn, N. Y. This invention relates to improvements on a former patented invention of the same inventor, and has for its object to cheapen the construction, and provide the joints of the worker with means whereby its parts may be permanently locked for holding the shutter at any desired position.

A running gear has been patented by Mr. George W. Shaw, of Taylorsville, Ky. This invention covers a special construction and combination of parts for a simple and efficient running gear for vehicles, which shall insure a firm connection between the head block and the hind axle, and successfully resist lateral and racking strains.

A washing machine has been patented by Mr. Howell T. Boydstun, of Monmouth, Kansas. This invention covers a novel construction and arrangement of parts in a wash tub, where the clothes are held down by springs between a corrugated under and upper part of rubber, and the latter can be easily operated by a lever to rub the clothes.

A nut bar has been patented by Mr. James Gillespie, of Springfield, Ill. In rolled bars for making hexagonal nuts, the angular depressions on opposite edges are made to alternate with each other, by passing through properly formed rolls, so the notched bar will be of the same width throughout, doing away with undue compression, and the nuts may be stamped or cut from the bar without waste.

A feeder for roller mills has been patented by Mr. Joseph W. Wilson, of Brookville, Kansas. This invention consists of a specially constructed double vibrating feeder, in which a rubberstrip is suspended from the under side of the shoe so that it hangs down between the two pairs of rollers, allowing the vibration of the shoe, while effecting the perfect separation of the materials fed to the rollers.

A shoe fastening has been patented by Mr. Henry H. Rodman, of Wilkesbarre, Pa. According to this invention, the tongue piece is made of a single piece of leather with grooves cut near its edges, and the edges continued to form extension cords, so the tongue may be drawn bodily up or down, the drawing of it up pulling together the opening of the shoe so the cords may be tied around the ankle, while pulling it down loosens the cords and opens the shoe.

NEW BOOKS AND PUBLICATIONS.

HARBORS AND DOCKS. Their Physical Features, History, Construction, Equipment, and Maintenance. By Leveson Francis Vernon-Harcourt. Vol. I., text; Vol. II., plans.

This work treats of a most important and difficult department of engineering activity in a way that will interest the public, while it will be of especial value to engineers, as it gives such particular accounts of many recent works that the professional man can, with the drawings, go over all the principal details of construction. With the previous work of the same author on "Rivers and Canals," it is intended to present an elucidation of the principles and practice of hydraulic engineering, as applied to navigation and commerce, both inland and marine. The illustrations and descriptions are of docks and harbors in every part of the world, showing the jetty system, different styles of breakwaters and their construction, lighthouses, beacons, buoys, dock walls, lockgates, caissons, etc., of which the drawings are all made to convenient working scale. The work is a very comprehensive one, by an author evidently well equipped for his task.

THE PRACTICAL ENGINEER AND MECHANICS' GUIDE. By William A. Morrison, Lowell, Mass. Published by the author. Price $1.00.

This book is a record of the observations and experiences of the author during many years of business life, and has a large collection of tables, recipes, and selections from different authors on many subjects.

THE LENAPE AND THEIR LEGENDS. Being No. V. of Brinton's Library of Aboriginal American Literature. By D. G. Brinton. Published by the author, Philadelphia.

This book covers a series of ethnological studies of the Indians of eastern Pennsylvania, New Jersey, and Maryland, with a complete presentation and translation of what is supposed to be the "Walam Olum," or Red Score, said to have been many years lost. The book is one of a series which aims to put within the reach of scholars authentic materials for the study of the native races of America, and is a beautiful specimen of the typographic art.

THE NATIONAL ACADEMY NOTES AND Complete Catalogue for 1885, published by Cassell & Company, of New York, edited by Charles M. Kurtz, in addition to furnishing a list of pictures shown at the present spring exhibition of the Academy of Design, gives nearly 100 illustrations and many personal notices of artists, such as are likely to render the book not only useful to the visitor, but valuable for reference. There are in the present exhibtion 665 works—not so many as in some former years, though this was not from a paucity of offerings, but rather from a more rigid selection. The catalogue shows the names of many new and heretofore comparatively unknown artists. This little mentor to those who will visit the exhibition, or are especially interested in the development of artistic tastes among us, is sold at 50 cents a copy.

STEAM PUMPING MACHINERY forms the subject of a handsomely illustrated little book just issued by the George F. Blake Manufacturing Company, of New York, and which appears in Spanish as well as English. Besides the matters strictly germane to the excellent style of pumps made by the firm, the book has several pages of practical information on engineering points likely to prove handy for every day use.

Received.

THE PEOPLE'S MANUAL AND HAND BOOK OF POPULAR GOVERNMENT. Especially for use in the State of Pennsylvania. By John McMurray, Philadelphia. Published by the author.

CONTROLLING SEX IN GENERATION. By Samuel Hough Terry. The Fowler & Wells Company, New York.

A HAND BOOK ON THE TEETH OF GEARS. Their Curves and Properties and Practical Construction. By George B. Grant, Boston, Mass.

Special.

A SALESMAN'S NARROW ESCAPE.

To sell goods appears to be easy business, especially when the goods are so beautiful and attractive as to seem almost to sell themselves. But there are duties and responsibilities connected with the life of a head-salesman in a great establishment of which the casual shopper has very little idea. One of the largest houses in the artistic porcelain and glass business not long ago came near losing its chief salesman. Had he died, as it was expected he would, his place would have been a very difficult one to fill. His escape from death was indeed a very narrow one.

When our editorial correspondent recently called on Mr. Alonzo Clark, he found him surrounded by all manner of tasteful elegancies in china and bric-a-brac, in the spacious salesrooms of the well known house of Davis, Collamore & Co., Broadway and Twenty-first St., New York. Mr. Clark is a somewhat spare and sinewy gentleman of about 40 or over. He carries with him the marks of a severe tussle with disease, but shows, both in his countenance and his actions, that he has won the victory.

We will let Mr. Clark tell his own story:

"My trouble," he said, "was chiefly with my lungs and throat. Originally I had a good constitution, and came of a healthy family, my mother having reached the advanced age of 82, and being still an active woman. During the war I could endure long marches and severe fatigue, and could lie on the ground at night without being attacked by rheumatism. My first sickness was four years ago in a malarious region in Connecticut. The malaria got the better of me, and laid the foundation for catarrh and all the other evils I have been afflicted with.

"About a year and a half ago I caught a severe cold. My lungs became inflamed, and my whole system was prostrated. Soon I showed all the symptoms of consumption. I was entirely disabled, and unfit to attend to business. I was in the care of one of the best known physicians in the city, and one of the most expensive ones. But physicians could do little in reaching my case. The nearest they came to finding out what was the matter with me was when they told me that if I had any business affairs to settle, to see about it as early as possible, as I could not last long. It was understood at the store that I must die, and that my place would have to be supplied by somebody else. My weight, which had been 137, ran down to 110. Yet I had a firm courage, with a sure hope that somehow or other I would recover.

"After I got rid of the doctors, who had given me up to die, I got a little better, and was able to drag myself down to the store. A couple of lady customers spoke to me about Compound Oxygen, and advised me to go to the New York office of Starkey & Palen, and see Dr. Turner about it. I knew nothing about this remedy, but concluded to try it, just on a venture. On taking a few inhalations at Dr. Turner's office, I was surprised at the effect on me. It seemed a light matter to inhale something which was without taste or odor; but certainly it did me a great deal of good. My benefit began at once. I soon was able to walk up and down stairs. I took one 'home treatment,' which lasted me for three months; then I got a second. My appetite returned, and my sleep was good. When I first visited Dr. Turner, I had not for months slept in a bed. I had been compelled to take such sleep as I could get by reclining in a chair. My feet and ankles were badly swelled, and I seemed in all respects to be getting ready for the undertaker. After taking the Oxygen a while, I began to enjoy refreshing sleep for two or three hours at a time; I could lie in bed, and obtain rest and comfort by doing so.

"I will here say that I found great advantage in the use of the nose-piece inhaler for my catarrh. I inhaled directly through the nostrils, with the best effect. A yellowish pulpy secretion had been coming both from nose and throat. The effect of the Compound Oxygen was to cause this to stop, and with it the pain and unpleasant sensations I had been feeling in my head.

"Soon I found myself, to my great delight, able to attend to business, as of old. I had not all my former strength, nor could I expect it. But I was rapidly gaining, and have kept on gaining ever since. All last winter I was on duty, except a few of the wettest and most slushy days, when I thought it prudent to stay in the house. I have been able to attend to my regular business, and am now. Of course I am careful of myself. I do not expose myself to storms. I walk with ease a few blocks every day, and that without experiencing any great sense of fatigue."

"Mr. Clark, do you still continue the treatment, or are you independent of it?"

"Once in a while, if I have a slight return of throat trouble, I take a few inhalations, and with positive advantage. I do not now need to take it for catarrh, for my catarrh is all gone, to my great relief. I consider myself as thoroughly cured as I can be. I have gained most of my lost flesh back again, and am increasing. Of course I do not expect ever to be very stout."

"Are you, then, a believer in Compound Oxygen as a restorer of health?"

"Believer? Why, yes; most thoroughly and heartily. I cannot say too much for it. You cannot wonder that I have lost all confidence in the old systems. They could do nothing for me but tell me I was going to die, and they blundered when they told me that. Compound Oxygen brought me to what you see me now, and did it after they had failed. Yes; you may say that I believe in Compound Oxygen, and that I recommend everybody who is situated as I was to make a fair trial of it. I don't know what they make it of, and I don't care; all that I know about it is that it pulled me through. That's enough for me."

Compound Oxygen is not an experiment. It is tried and true. Hundreds of others give similar testimony to that of Mr. Clark. Many of those who have experienced the best benefits from it are those whom the old-fashioned doctors had given up. To learn all about Compound Oxygen, send to Drs. Starkey & Palen, 1109 and 1111 Girard Street, Philadelphia, for a deeply interesting little work on the subject, which will be sent you by mail.

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) W. S.—It is not customary to bleach wood. The color of maple depends entirely upon the cutting of it. This operation is best performed in cold weather. The condition of the tree and numerous other details must be carefully considered and followed out, or else the wood will be dark and unsatisfactory.

(2) W. H. T.—It has been suggested, though we believe the matter is far from being satisfactorily settled, that exposure to light makes potatoes bitter.

(3) T. J. D. writes: On the hill above Canyon City are two water tanks, 10x12 feet, and 8 feet deep. These tanks are about 2½ feet apart, but are connected at the bottom by a 3 inch iron pipe. Another iron 3 inch pipe leads from one of these tanks to a hydrant 120 feet lower. There is no decrease in size of pipe at the hydrant, as it is simply a fire plug on which to fasten the hose in case of fire, thus forming a hydraulic fire extinguisher. Now, if the two tanks were full, and the supply cut off, and the water should be turned loose at the hydrant, would these tanks lower equally? If not, how much water would be in the one tank when the other was empty? A. The tank having the hydrant connection would fall the fastest, but how much, depends largely upon the size of the nozzle at the hydrant. If the full capacity of the 3 inch pipe should be used, the hydrant tank would be emptied when the other would be half full. The smaller the nozzle used the more nearly equal would the water remain in the tanks.

(4) J. D. asks for a bedbug poison. A. Set in the center of the room a dish containing 4 ounces of brimstone. Light it, and close the room as tight as possible, stopping the keyhole of the door with paper to keep the fumes of the brimstone in the room. Let it remain for three or four hours, then open the windows and air thoroughly. The brimstone will be found to have also bleached the paint, if it was a yellowish white. Mixtures such as equal parts of turpentine and kerosene oil are used; filling up the cracks with hard soap is an excellent remedy. Benzine and gasoline will kill bedbugs as fast as they can reach them. A weak solution of zinc chloride is also said to be an effectual banisher of these pests.

(5) H. J. H. asks for a formula to make a good A No. 1 shoe dressing. A. Try the following:

Gum shellac	½ pound.
Alcohol	3 quarts.

Dissolve and add:

Camphor	1½ oz.
Lampblack	2 "

The foregoing will be found to give an excellent gloss, and is especially adapted to any leather, the surface of which is roughened by wear.

(6) E. de F.—For hektograph use:

Good ordinary glue	100 parts.
Glycerine	50 "
Barium sulphate, finely powdered or the same amount of kaolin	25 "
Water	375 "

For ink and method of preparing the pad see answer to query 57, in the SCIENTIFIC AMERICAN, for February 7, 1885.

(7) T. A. P.—A pound of very fine steel wire to make watch springs of, is worth about $4; this will make 17,000 springs, worth $7,000.

(8) J. H. D.—The highest point reached by man was by balloon 27,000 feet. Travelers have rarely exceeded 20,000 feet, at which point the air from its rarity is very debilitating.

(9) J. W. asks how to cast ingots of resin so that the resin will not stick to the mould and the surfaces shall all be bright. A. Cover the contact surfaces in the mould with pure glycerine.

(10) D. D. asks whether it injures a shot gun, by expansion or otherwise, to clean it with boiling water. A. No; cleaning guns with hot water is a common practice.

(11) T. F. A. asks how ingot copper is run or what process it goes through to get the color. A. The rich color on copper ingots is obtained by sprinkling them with water as soon as the metal sets; which prevents oxidation.

(12) C. A. P. asks: Can you advise me concerning photography in colors. A. No way has yet been found to make photographs direct, in the camera, of natural colors, as, for instance, a landscape. Uranium photography applies to the taking of pictures on a film sensitized by uranium salts.

(13) F. B. P. writes: 1. I wish to make some castings of Babbitt metal for experimenting purposes. Could you tell me what to put in it, that would keep it from breaking as easy as the common Babbitt? A. You can add tin to your Babbitt metal until it is as soft as you may require. 2. Can I use anything in the place of sand for my moulds? A. Sand is the easiest to manage for moulds. It will cast well in metallic moulds.

(14) C. M. C.—For coloring a skin after it has been cleaned, dip into decoctions o. varying quantities of logwood and Guinea wood. For darkening a small quantity of iron sulphate is used. Or dip the skin first into a bath of catechu and then into potassium bichromate.

(15) W. H. asks (1) for the shortest and cheapest method of removing silver from plated ware before replating. A. Dip the article in nitric acid, this will remove the silver. 2. A formula for white metal? A. Try the following formula. It takes a fine polish:

Copper	69·8 parts.
Nickel	19·8 "
Zinc	5·5 "
Cadmium	4·7 "

3. A formula for removing grease from table ware, using caustic potash? Can anything cheaper be used? Please describe about what quantity to use with quart of water, probably it will not be too expensive. A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 310, for directions as to preparation of cleansing liquid for plated ware. 4. State price of white metal in New York. A. White metal is not generally sold in the New York market, and therefore we cannot give you a price on it. It is generally made direct by those who use it.

(16) I. T. S.—The less basic phosphate of lime is prepared by pouring a ten per cent solution of hydrochloric acid on as much ("equal weight") of bone meal burnt white as you use solution, i. e., 1 pound solution (10 per cent acid, 90 per cent water) to 1 pound burnt bone meal. Use then 50 parts of this product to make your baking powder.

(17) C. G. P.—The machinery used by the oil cloth makers in this country is of special construction, and made only to order from designs prepared by the individual manufacturer.

(18) F. K.—Printer's ink cannot be completely removed from cards. A solution of benzol or turpentine may sometimes remove small spots, but the process is not a success.

(19) L. F.—Soap and water make about as good a compound as can be used to give the skin a healthy clean color. See Dr. J. V. Shoemaker's article on the skin, in SCIENTIFIC AMERICAN SUPPLEMENT, No. 210.

(20) C. W. T. writes: I have an oleomargarine tank which I want to use to hold water for a boiler. How can I remove the grease? A. Use a solution of caustic potash, which will form a soap with the grease.

(21) N. P. W.—Tar soap is made from soap cut into shavings, 2 parts, tar 1 part; and liquor of potassa, 2 parts; the whole being intimately mixed in a mortar.

(22) H. L. writes: I render my lard by steam, and it has a very nice flavor, but it is not as white as it ought to be, and I would like to find out what to use to make it white. A. We understand that hydrogen peroxide is used. You will find a description of this substance given in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 184 and 339.

(23) J. E. D.—United States Government bonds are specially excepted by law from taxation, but greenbacks in hand are taxable the same as any other description of personal property.

(24) A. P. C. asks the weight and value of a cubic foot of solid gold or silver. A. A cubic foot of gold weighs about 19,300 ounces, and gold is worth $20.67 per ounce. Silver is worth $1.29 per ounce, and a cubic foot weighs 10,500 ounces. Consequently the cubic foot of gold would be worth $398,931 and the silver $13,545.

(25) J. B.—Meerschaum is the common name for the mineral serpiolite, and it is a hydrated silicate of magnesium. The word meerschaum is the German equivalent of sea foam.

(26) J. M. M. asks: What is meant by "microcosmic salt," used as a reagent in the analysis of metals? A. Microcosmic salt is a hydrogen sodium ammonium phosphate, having the chemical formula $NaNH_4HPO_4$, this is to say, it is a tribasic phosphoric acid, in which two atoms of hydrogen have been replaced, one by sodium, the other by the ammonium radical. See also Webster's Dictionary.

(27) T. A. asks a receipt for a substance that one can put in a pipe and wet it, and it will burn. A. Metallic sodium or potassium will do this but they must be handled with great care.

(28) S. M. B.—Neither alcohol nor glycerine freezes except at very low temperatures.

(29) G. C. K.—Do not know that gas meter leather has any special preparation as a preservative. Fine grained kid is generally used, dry.

(30) J. W.—We think that if you will use heavy moulds of metal brightly polished and keep them at a low temperature, that is, do not allow them to get warm, you can in this way cast ingots of resin. It is not necessary to use any lubricators.

(31) J. L. S.—The imperial gallon is 277·27 cubic inches. United States standard gallon is 231 cubic inches. See Webster's Dictionary.

(32) J. B. C. writes: I have an inch pipe running from the steam drum of my boiler (with a globe valve near the boiler) into the lint room of my gin house, with the purpose of emptying the boiler of steam therein, in case of fire. There is a doubt in my mind as to whether the pipe would be more serviceable as it is, or if it led from near the bottom of the boiler. Would like to hear your opinion on the subject. A. Your steam fire connection is right where it is, which is the usual arrangement for steam fire apparatus. If you connect with the water space in the boiler you will gain nothing and endanger the boiler also, in case of fire in the gin house. The end of the steam pipe should terminate near the point of greatest danger.

(33) A. C. D. writes: I am using a rotary pump which takes cider through a spiral hose. The wire, which is probably brass, troubles me by corroding. How will I obviate this difficulty? What will remove the oxide, or what will coat over the wire and prevent corrosion? A. You should not use a hose lined with brass wire. It is a source of poison. You can have suction hose made with rubber lining so that the spiral wire will be covered on the inside with rubber, by any rubber company.

(34) W. S.—Babbitt metal is not suitable for small castings that are not intended for journal bearings. It does not run freely; put a little tin with the Babbitt metal, or use type metal for such work.

(35) E. H. H.—Later editions of Haswell have been improved and enlarged, with many of the formulas corrected. A velocity exceeding 8 inches per second will remove silt and clay. Exceeding 15 inches per second, will remove river sand and small gravel. Exceeding 33½ feet per second, will remove shingle or coarse gravel.

(36) S. R. G. writes: Suppose a cannon ball and a rifle bullet be fired at the same instant toward each other and on the same line, so that they collide, then when the bullet strikes the cannon ball and is carried along with it does the bullet stop before taking the course of the ball? A. The shape of the bullet will be destroyed by the contact, but every particle will stop before reversal, although we may not be ableto comprehend the shortness of time.

(37) J. C. C. P.—It is claimed that a train may safely be stopped at 500 feet. Steam is always shut off for ordinary stoppages before putting on brakes. The Westinghouse brakes are now very popular on our railroads, and are considered the most perfect.

(38) C. J.—The outside rail is always made the highest on purpose to counteract the tendency to run off, for the same reason that when you ride your horse around a small circle you both lean toward the center in order that the horse may keep the track and you keep on his back.

(39) W. C. G.—Kalamein is not a metal, but only a name for a tinning process on iron, the alloy of which is composed of tin and lead like the common tin that is called Terne plate.

(40) C. M.—The relative size of a shaft of great length depends entirely upon the points at which it receives and gives out its power. If the power is received on one end and distributed along the shaft it is more economical to have it reduced in size at one or more points, but if the whole power may at any time be required at the farthest end, then it should be full size its whole length.—The price of an assay for gold and silver is not less than $5, and may be considerably more.

(41) S. L. P. asks: What is the best way to reduce tin dross made in tinning wire? I use tallow as a flux, is there no better way? Can't the oxide be reduced so as to save all the tin? A. It does not pay to attempt to recover the tin from the dross in tinning operations. The large operators in tinning sell the dross to the color makers or chemical manufacturers, who make it into tin salts used in dyeing. The tin dross contains a little iron absorbed from the wire which could not be removed by merely reducing the oxide.

(42) C. H. L. writes: Supposing the paddle wheels of a side wheel steamboat, whose speed is about 12 miles an hour, could be driven at the rate of 3,000 or 5,000 revolutions a minute, would it increase or decrease the speed of the boat? I claim the latter, but a large number of my friends claim it would largely increase the speed. Which is right? A. So great speed of side wheels will not only decrease speed from the rate named, but would prevent the water entering between the buckets. In which case there could be little or no power for propulsion. You are right.

(43) J. D. B. asks: Has any correct geometrical solution of the "trisection of an angle" ever been published? If so, when, and where? A. We know of nothing later on the trisection of an angle than its demonstration in Leslie's Geometrical Analysis. We understand that it cannot be effected by plane geometry, but may be accomplished by means of the conic sections.

(44) W. C. asks: What are the ingredients and proportions of the chemicals used to dip the ends of parlor matches? A. Either of the following will answer: 1. ½ part by weight phosphorus, 4 potassium chlorate, 2 glue, 4 finely powdered glass, 11 water. 2. 2 parts by weight of phosphorus, 5 potassium chlorate, 3 glue, 1½ red lead, 12 water. See article on "Friction Matches," page 1332, SCIENTIFIC AMERICAN SUPPLEMENT, No. 84.

(45) R. W. writes: I have a rubber coat, and the rubber has got worn off and is not waterproof. Can you give a receipt for it? A. We do not think that you can improve the coat in any way. Possibly by coating it with a solution of rubber in carbon disulphide and allowing it dry you might somewhat improve it. See the article on how waterproof goods are made in SCIENTIFIC AMERICAN SUPPLEMENT, No. 251.

(46) G. H. B.—A male catamount, or cougar, has a body 4 to 4½ feet long, the female being somewhat smaller. It is also known as the puma, American lion, and catamount, and is as much larger than the wild cat as the latter is stronger and fiercer than the domestic cat.

(47) F. F. M. asks: 1. How can I construct a rain gauge? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 419. 2. How, and what of, will I build a small kiln to reduce oyster shells to lime? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 360. 3. A short description of diamond drills and their cost? A. For diamond drills and their cost address manufacturers who advertise in the SCIENTIFIC AMERICAN. 4. I want to season some inch sections of native woods, averaging four inches diameter. I've tried kerosene, also oven drying, in longer and shorter sections, but wood would crack and bark peel off. Outdoor seasoning is too slow; I want to preserve the color of wood. A. There is no other way than slow drying; pack in a box, and exclude air for six months. 5. On a tree, if a limb is cut off flush with the bark, will the balance of limb left in the tree decay and be crowded out, and the vacancy be filled with woody fiber; will the bark grow over again? A. The wood grows over cut limbs. 6. A growing tree marked with a blaze or hacks; will such marks always remain at the same level, or tend to rise with the growth of the tree? A. Remain at same level. 7. What causes shaking asp leaves to be always in a quiver? A. The wind or vibration of the air only causes the quiver of the aspen leaf. 8. What is used to measure cold below 35° Fah., as mercury or alcohol is irregular? A. Metallic thermometers are used to measure lowest temperatures, alcohol being quite irregular 9. Is the top surface of ice on a pond, the amount of water let in and out being the same day by day, on a level with the water surface or above it? A. Ice is slightly elastic, and when fast to the shore the central portion rises and falls with slight variations in water level, the proportion above and below water level being as is the weight of ice to the weight of water it displaces. 10. Of the two waters, hard and soft, which freezes the quicker; and in ice which saves the best in like packing? A. Soft water freezes the quickest and keeps the best. 11. Will slush ice save better than block ice? A. If you mean by block ice clear ice, it keeps the best. 12. Will boiled water freeze quicker than before boiling? Or steam water quicker than either the others? A. Yes. 13. Does water in freezing purify itself? A. Clears itself from chemicals; does not clear itself from mechanical mixtures as mud and clay. 14. Why is the inclined plane not used by any canal in the world but the Morris canal, running from Jersey city to Phillipsburg? A. Inclined planes on canals are only used as necessities; possibly because other canals do not need an inclined plane. 15. I've heard the statement made that Roebling, Niagara Bridge engineer, selected for the iron in his cables ore mined at Andover, N. J., after tests made of various foreign and home ores; is this so? A. Very probably so. 16. In cutting ice with a cross cut saw, does it ruin it for a timber saw; if so, why? A. It does not ruin the saw. 17. How do engineers classify masonry as first class, second class, etc., in piers and abutments? A. First and second class are terms for quality of material and workmanship. 18. Is kerosene oil magnetic? A. No, unless combined with iron. 19. Why is it that so many chestnut trees are struck by lightning? Is it not altogether on account of their standing alone, because they are struck in the woods? A. We do not know that an undue proportion of chestnut trees are struck, considering the isolated and irregular way they generally grow. 20. Will setting a compass near or under them affect the needle? A. We see no reason why it should.

(48) S. E. S.—The best mode of curing, tanning, and dressing skins, such as beaver, musk rat, fox, etc., with the fur or hair on, so as to be soft and durable for cloaks, trimmings, and fancy articles, forms a rather intricate trade, in which there are but few experts. The latest book on this subject is Davis on the Manufacture of Leather. As to the best method for stuffing, or curing and stuffing, the skins for mounting purposes, Maynard's Manual of Taxidermy will be most useful.

(49) J. E. K. writes: Two cog wheels of equal diameter, one stationary, the other loose. How many times does the loose wheel revolve on its axis in making one complete circuit of the stationary wheel? If more than once, why? A. It will revolve twice, a problem easily proved by trial, and often answered in this journal. The device is old, was used by James Watt, and called the sun and planet gear. It matters not which wheel is stationary, their relative revolutions are governed by the formulas for geared wheels as pertaining to this class. For various proportional wheels, divide the sum of the peripheries of the two wheels by the periphery of the rolling wheel, for the number of revolutions.

(50) T. W. D. & Co.—To keep your show windows free from frost and steam you will have to close them out from the rest of the store, which can be done by glass doors. Then ventilate each window from outside by a small hole at top and bottom. Keep the doors in the partition closed so as to keep the warm moist air of the store from coming in contact with the front windows, and you will not be troubled with frost and moisture on the glass.

(51) H. L. K. asks, 1, how to digest different substances, how long it takes, and, if all is not digested, how to tell when the liquid is done digesting? A. Digesting generally signifies a gradual solution by heat or a bringing into a homogeneous fluid mass by heat. Experience, when the time is not specified, is the best guide. 2. How to displace gases in order to catch other gases, as water absorbs and mercury decomposes them? A. This question is too vague. 3. A good mucilage or glue for putting labels on acid bottles, so that the acid has no effect on the composition. A. Use the following directly on the glass: First dissolve 200 parts shellac by heat in 3,000 parts water with 300 parts borax; strain while still warm. Then add a solution of 80 parts of nigrosine, 3 parts tannin, 1 part picric acid, in 150 parts spirit of hartshorn, and 70 parts water. Keep in well corked bottles. 4. A compound that will remove freckles, but does not injure the skin. A. Use sulpho balate of zinc 2 parts, distilled glycerine 25 parts, rose water 25 parts, scented alcohol 5 parts. To be applied twice daily for from half an hour to an hour, and then washed off with cold water. 5. What does O. N. T. stand for seen on spools of cotton? A. Our new thread.

(52) J. A. O. writes: I have a square cistern, 8 by 12, and 14 feet deep, arched over. The cistern is in a wet place, and I have made, first, a rough 18 inch stone wall with cement mortar, and inside this an 8 inch brick wall with cement mortar, and then had the whole cistern well plastered all round with cement. Now, I cannot keep the water from coming in through all this, and at the same time the water has a bad taste, like cement. A. We fear that you have used poor cement, and laid the walls too loosely. For the brick wall nothing but the best Portland cement should be used. Slush the brick well, so as to have every crevice solid.

Build the brick lining an inch clear from the stone wall, and ram the space with equal parts coarse sand and Portland cement as you build the courses, so that you will have a solid and uniform portion of Portland cement concrete. The bottom should also have a continuous partition of the concrete under the brick floor.

(53) F. L. B. writes (1) for a solution that will make either leather or India rubber adhere to goloshes. I have tried hyposulphide of carbon and gutta percha, but this won't act. A. Dissolve a quantity of gutta percha in chloroform in quantity to make a fluid of honey-like consistence. When spread, it will dry in a few minutes. Heat the surfaces at a fire or gas flame until softened, and apply them together. Small patches of leather can thus be cemented on boots, etc., so as to almost defy detection. It is waterproof, and will answer almost anywhere unless exposed to heat, which will soften it.—Your other questions should be answered by some physician.

(54) H. M. R. asks how to remove ink stains from linen. A. Wet the finger in water, then dip into a powder consisting of one part of finely powdered oxalic acid mixed with four parts of cream tartar, and rub it on the spot gently, keeping it rather moist, and the stain will disappear without injuring the fabric. After the stain disappears, wash the linen in pure water.

(55) G. B. B.—A fireproof whitewash can be readily made by adding one part silicate of soda (or potash) to every five parts of whitewash. The addition of a solution of alum to whitewash is recommended as a means to prevent the rubbing off of the wash. A coating of a good glue size made by dissolving half a pound of glue in a gallon of water is employed when the wall is to be papered.

(56) W. J. D. asks how to make a small portable "filter," to be used on a faucet for filtering hydrant water. A. The essential feature of the ordinary portable filters is a layer or stratum of sand and coarsely powdered charcoal; the water, however, first passes through a sponge, in order to remove the coarser portion of the impurities. This is inclosed in a brass tube fitting by means of a thread on to the faucet, and also it is capable of being opened at the center, so that from time to time the filtering substances can be renewed.

(57) W. H. C.—A red ink for marking clothes, which is not attacked by soap alkalies or acids, can be prepared as follows: Enough finely pulverized cinnabar to form a moderately thick liquid is very intimately mixed with egg albumen previously diluted with an equal bulk of water, and beaten to a froth and filtered through fine linen. Marks are formed on cloth with this liquid by means of a quill, and are fixed after they have become dry by pressing the cloth on the other side with a hot iron.

(58) F. G. T.—It is wrong to paint the drums of meters; they should be of good enough material to stand without it unless the gas is very bad. As for the cases, if they are heavily tinned they should not need painting. If, however, you desire a coating, the ordinary asphalt varnish will be found quite serviceable, or perhaps better still a mixture of red lead with linseed oil will be found to answer your wants.

(59) J. G. H.—The so-called jeweler's chamois to which you refer are also obtained from abroad, and as far as we have been able to ascertain, no one has ever been successful in impregnating the skin with the polishing powder in this country. It is presumed that this operation is accomplished at some intermediate stage during the process of preparing the skin for the market, and cannot be done after the skin is prepared.

(60) W. B. S. asks for information in regard to dissolving platinum. A. Dissolve the platinum in a boiling solution of aqua regia; this reagent consists of 1 part nitric and 2 of hydrochloric acid by measure. The operation must be continued until no nitric acid remains, thereby forming the platinum chloride. The fumes from this operation are very offensive and corrosive, so it may be found more satisfactory to purchase the platinum chloride rather than to attempt to make it.

(61) E. F. S. asks: Has a rate of speed equal to 90 miles an hour, ever been attained by railroad locomotive? Do the Grant Locomotive Works make such an engine? A. It is extremely doubtful if any locomotive ever made so high a speed. A mile in 48 seconds is the shortest time we have heard of. A rate of 70 to 75 miles per hour has been made on a spurt, on good straight track. The Grant Locomotive Works could make such an engine. A. Is not 60 miles an hour considered remarkable time for trains on railroads to make, or is it something that is done frequently and by ordinary engines? A. 60 miles an hour for a train is considered a very high rate of speed, and is seldom attained in practice for more than a short run.

(62) E. G. writes: I desire to operate an electromagnet under water; what effect will the water have on the magnetic power? A. None, provided the coils are insulated. 2. What is the best way to insulate the magnet from the surrounding water? A. A coating of paraffine or shellac will do it. 3. What is the best way to make a magnet lever so as to prevent rust in the journals, being operated under water? A. Make it of brass; or bronze, nickel, or copper the exposed iron parts.

(63) P. J. O'M.—Boilers should be tested when new at twice the pressure they are intended to be used. A majority of stationary boilers in New York are tested at 150 pounds. The New York sanitary test is about 50 per cent higher than the certificate of pressure allowed. Cold water pressure is usual. You may obtain a pump from $10 to $30. Any pump that will make the pressure will do, and there is a great variety of makes.

(64) W. B. asks: 1. Will a two inch pipe with one inch faucet give more water than a one inch pipe with one inch faucet, both pipes leading from the bottom of the same tank, leaving friction out of consideration? A. The friction cannot be left out of the question. The 2 inch pipe will give the greatest flow. 2. Why do miners begin with a large inlet in hydraulic mining? A. Taper nozzles are found to give the best results, or quickest flow for a given head.

(65) C. T. writes: I want to make a wire solder to be applied without a soldering iron. Can you give me the preparation of lead and tin and the method of preparing it? Does it require any acid or rosin mixed with it? I saw it sold on the street in New York seven years ago. A. Mix 2 parts tin, 1 part lead by melting. Stir well together and pour slowly into a little sheet iron pan with small holes perforated along the bottom edge, at the same time draw the pan along a plate of iron or a smooth stone. The solder will run through the holes, forming little parallel strips. A little practice will make you perfect.

(66) A. S. asks how to make melted brass stick to wrought iron. Should the iron be hot, and how is it best to proceed? A. The iron should be at a full red heat. It should be clean, and covered with borax. The brass should be poured very hot, and in quantity so as to run over, that the surface of the iron may be brought up to the brazing temperature.

(67) A. V. W. aks why it is that on the ceiling of a lath and plastered room one can see every joist and lath, the space where the joist and lath are being alike. A. Plastered ceilings are porous, allowing air to circulate through them. The air carries dust and smoke with it, which lodge on the surface, the ceiling acting as a filter. Where beams and lath back the plaster, the circulation is impeded or entirely stopped, which prevents the lodgment of smoke and dust.

(68) J. T. R. asks whether one could detect any free oxygen in a jar of nitrogen by means of a lighted candle. A. If the quantity of oxygen was slight, we do not think it could be detected. The fact that nitrogen does not support combustion would sustain the probability of oxygen being present in the mixture if a candle burned in the jar. We should suggest the use of pyrogallic acid as being a more satisfactory test. This compound absorbs oxygen very readily, turning black.

(69) A. N. D. asks for a receipt for a cement which will stick sheepskin firmly to white or sheet iron, and which will stand an occasional wetting. A. Spread over the metal a thin hot solution of good glue; soak the leather with a warm solution of gall nuts before placing on the metal, and leave to dry under pressure. If fastened in this manner, it is impossible to separate the leather from the metal without tearing it. See also receipts given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(70) M. C. asks: 1. How is the silver currency of the United States made? A. See article entitled "United States Mint, Philadelphia, Pa," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 117. 2. I have had occasion to use quicksilver and white of egg on furniture. Would it be safe to use hot soap suds therewith. Some say the quicksilver coming in contact with the hot water would salivate the person working with it, or any one in the room. A. We fail to see any reason why hot soap suds should not be used. The action of hot water on mercury would be so slight that probably no injurious effects would follow. Quicksilver itself is not poisonous, except in state of vapor or when finely divided. The salts, however, are injurious. If carefully handled, no danger should follow the use of hot water on mercury.

(71) D. asks for a prepared chalk that could be used to mark patterns, before sending to foundry, that would not be rubbed off in handling, but that could be erased when desired. A. French chalk or colored chalks might be used. Ordinary colored pencils would make a mark quite permanent, and yet one which could easily be removed. The artists' pastels could likewise be used.

(72) J. A. L.—Coil springs have been made of considerable power, say up to one or two horse, but it has been very expensive to make such springs, and it requires more power to wind them up than can be got from them. They are used to a limited extent for sewing machines and some other light machinery, mechanical toys, and clocks. The practical working of large springs has not as yet been a success, and they are liable to breakage, but for small powers are frequently available. Our advertising columns give names of manufacturers.

(73) J. D. A. desires a recipe for making printers' inks—black and red. A. For black ink: Take of balsam of copaiba (pure) 9 ounces, lamp black 3 ounces, indigo and Prussian blue of each half an ounce, Indian red ¾ ounce, yellow soap (dry) 3 ounces; grind the mixture to an impalpable smoothness by means of a stone and muller. Canada balsam may be substituted for balsam of copaiba where the smell of the latter is objectionable, but the ink then dries very quickly. The red inks are similarly made by using such pigments as carmine, lakes, vermilion, chrome yellow, red lead, orange red, Indian red, and Venetian red.

(74) F. A. asks how the insides of telescopes, microscopes, and laryngoscopes are blackened. A. Lampblack mixed with turpentine answers well for this purpose. Lampblack mixed with alcohol having a very slight trace of shellac in it also answers very well indeed.

(75) A. H. asks: 1. What will produce a high polish on bleached cotton cloth? Must be colorless and applied with a brush, must wash off with ordinary soap and water, must be cheap. A. Try cold starch with one-quarter its weight of isinglass. Dissolve the isinglass in warm water, and stir in the starch. 2. What is the most nourishing steam bath that can be applied to a person who is unable to sweat, and can take but little food in the stomach? A. Produce the sweating by burning alcohol under a chair in which the person sits, with blanket covering to hold the heat. Use caution and but little alcohol. Fire it in a shallow iron pan or old saucer. 3. Where can I procure a steam boiler that will stand from 10 to 25 pounds pressure, the dimensions are say 2 feet in diameter by 3 feet high, with fire box under it, and at about what cost? A. From any boiler maker in cities nearest. Cost about $125. 4. Supposing I have a deed, the original writing on the body of which is claimed to have been eliminated and rewritten, while the acknowledgment of same at the bottom of deed is claimed as the original acknowledgment. By what means can I detect this either chemically or with microscope? The ink used being an aniline or ordinary ink, such as is put on the market. A. You should consult an expert, who can only advise after examination of the document in question.

(76) B. W. D. asks for a receipt for coloring meerschaum pipes without smoking. A. The meerschaum is steeped or heated in linseed oil which has been suitably colored by means of dragon's blood and gamboge; or else the same effect may be produced by boiling in wax to which dragon's blood has been added as coloring material. The meerschaum to be treated must be dry and free from any previous application of oil or wax. The manipulation is one requiring skill and experience.

(77) J. P. K.—For the manufacture of vinegar, the essentials are the oxidation of liquids containing alcohol by exposing such solutions to the action of the air at a temperature between 75° and 85° Fah. The details of the process depend upon the quantity you desire to make. Some expose the liquor in vats, others in barrels. The manufacture of vinegar by means of bacteria is described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 247, to which we refer you.

(78) T. B. J. asks the proportions of oleic acid, glycerine, and water necessary to produce the bubbles alluded to in No. 2, vol. lii. A. Dissolve Castile soap in strong alcohol, let it settle or filter, and take the clear solution, from which evaporate the alcohol. The solid residue is oleate of soda. To this add half its weight of glycerine and sufficient water to give the proper consistency. Another method consists in shaking fine shavings of palm oil soap in a large bottle with distilled water, until a concentrated solution of the soap is obtained; this is filtered through gray filtering paper, and then mixed with about one-third its weight of pure glycerine. The fluid is to be well shaken before using.

(79) J. W. P. writes: Can you give me a receipt for a cement or glue that will hold emery on a felt wheel for polishing iron or castings? Common glue will not hold, as the heat caused by the friction warms the glue and loosens the emery so that it rubs off. A. The felt wheel is first filled with oil, then the emery powder is poured on, and mixing with the oil forms the polishing material. No glue is to be used.

(80) J. M. G. asks (1) how a crust of whitewash can be removed from the ceilings of rooms? A. Whitewash can readily be removed by scraping the ceiling or else by washing it off with water. 2. What system of shorthand would you advise a young man to learn? A. Either Graham's or Munson's system is good. Both are extensively used.

(81) G. C. H. writes: I have a vat 12 feet wide and 10 feet high, holding about 7,000 gallons, which I use for storing vinegar in. It is constructed of American pitch pine (new wood). When the vinegar has stood in it a short while, it acquires an unpleasant smell and taste from the rosin or turpentine of the timber. I have tried to cure this by coating the inside with paraffine, but I have not succeeded. What can I do to effectually overcome the evil? A. Your tank should have been constructed of white pine or else of white oak—the latter is the better; then lined with paraffine. If the latter be thickly applied, we fail to understand how any odor can penetrate it. Before the process of paraffining became prevalent, a thick coat of whitewash used to be employed, and sometimes shellac was used to form the lining of the tank, but paraffine has at present replaced these substances.

(82) R. G. H.—Ordinary powdered glass is used with the varnish. A Bunsen burner is one which burns with a non-luminous flame, in consequence of the introduction of a current of air near the base of the burner. They may be readily obtained from any dealer in chemists' or druggists' outfits.

(83) J. D. W. asks: Which is the most durable, iron or brass, for thin wire stretched on a fence and exposed to the sun and weather? A. Both wires being naked, and with no tension, the brass wire would last longest. With tension the iron wire will not break, while the brass wire becomes brittle, and soon breaks. Galvanized iron wire is the best.

(84) M. asks how to make a steam whistle at small cost that will act with amount of pressure used to run a fair sized toy engine. A. Make or buy a toy whistle of tin of the same pattern as the boys make of willow twigs, and solder a small pipe to the mouth.

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

A. & H.—The sample appears to be a limestone rock containing small shiny particles of mica. An assay to determine the pressure of either gold or silver would cost $5.—J. B.—The specimen is clay and of no probable value in New York city on account of the nearness of the deposits in New Jersey.—C. S. C.—The button is composed essentially of silver; it contains some copper, and probably iron.

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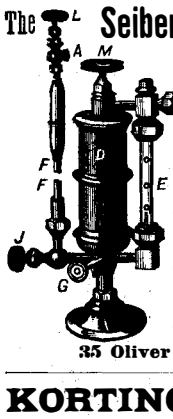

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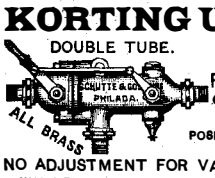

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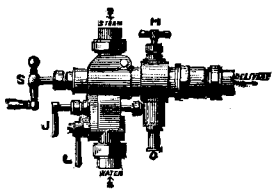

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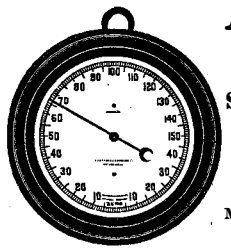

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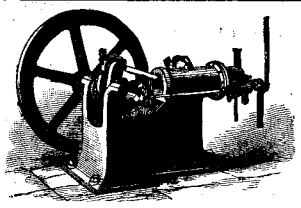

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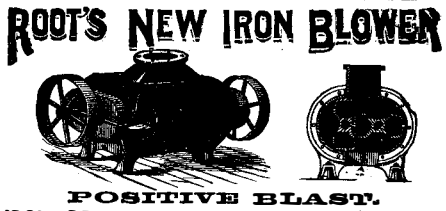

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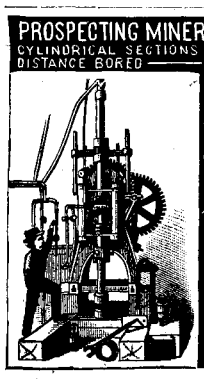

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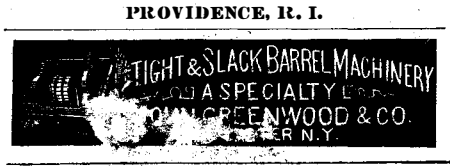

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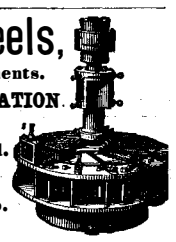

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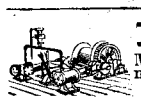

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