SCIENTIFIC AMERICAN

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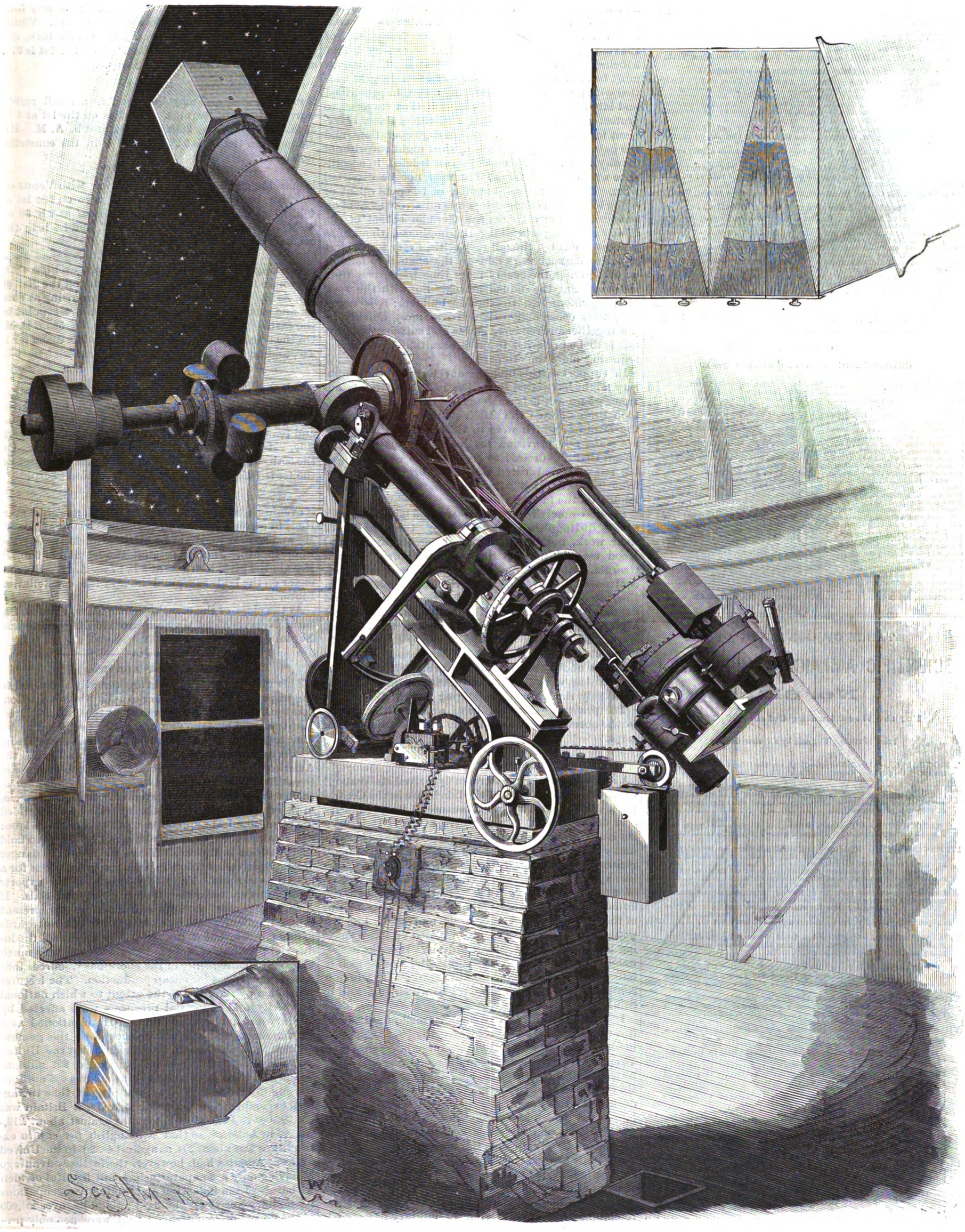

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NEW YORK, SATURDAY, OCTOBER 29, 1887.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 617.

For the Week Ending October 29, 1887.

Price 10 cents. For sale by all newsdealers.

HASTENING THE MILITARY PIONEER.

Quick rather than fine work, our German contemporary, *Militar Wochenblatt*, insists is required of the soldiers selected as the pioneers of an army in the field. In an instructive article on the training of this corps, it suggests that the timepiece rather than the yard stick should be the test. In the work of the pioneer, the German's attention to details, following what he calls the *durch und durch*, or thorough, system acts, as may easily be supposed, to retard operations. An exposed and retarded division cannot wait while the trench shelters, already dug, are carefully trimmed, nor an advancing column be kept inactive while the pontoons of a temporary bridge be carefully aligned and mathematically arranged. If the trenches will protect or the bridge bear them across the stream, that is all that is required. In the German school of the soldier, the trench shelter must be exactly 1 foot 3 inches deep, and its parapet 1½ feet high. Gabions must be made of straight stakes of exact length, wattled with green twigs or osiers in a certain prescribed and labored fashion. Gabionades used as traverses to protect guns from enfilading fire, the gabion revetment for service in the trenches in siege operations, and the gabion trip, a protection against night surprises of cavalry and infantry, must be constructed in accordance with certain formulæ that may not be departed from. Even in the construction of the pontvalent or flying bridge to bear troops across a narrow moat of an outwork during a siege, the German school of the soldier exacts a painstaking thoroughness, though, as is pointed out by the military critic, every second lost in perfecting such work adds to the chances of failure, because giving the enemy more time to recover from his surprise at the sudden attack. So with the work of the *pontonieren*, the bridge builders; it is urged that that construction which can most quickly be put together and rendered stable and sufficiently buoyant is to be preferred to more scientific construction requiring more time to perfect.

In support of this opinion, our German contemporary might have cited the orders of Darius to his advance guard while it was engaged in throwing a pontoon bridge across the Hellespont, and again across the Danube; which were to the effect that they need not make any provision for his return, by which he meant that he desired to cross at the earliest possible moment, and cared not if the bridge were torn from its anchorages after the last man was safely landed on the farther shore.

In our own civil war the sappers and miners of both armies distinguished themselves by the rapidity of their work, notably when the Confederate General Hood essayed to stop Sherman's advance through Georgia. More than once, when the enemy's work confronted the invading army, the Federal pioneers, in the face of a sharp fire, raised parapets on hills and mounds of earth, and by this means the gunners got a plunging fire upon the covered way of the besieged work. This trench cavilier was rarely of correct dimensions, but it always gave a command of at least four feet above the crest of the protected way of the confronting works, and was constructed in an almost incredibly short time, considering the conditions.

The practical Germans have awakened, it seems, to the necessity for haste in the work of the pioneer corps.

THE CROWNED CRANE.

A Kaffir or crowned crane recently arrived stalks about the little inclosure back of the lion house in the Central Park, New York City, and, because of its peculiarity as well as its rarity, is well worth a visit. It is from the North of Africa, and will be found in the text books under the head of *Balearica Chrysopelagus*, though generally known as *B regulorum*. African explorers like Speke and Grant and Richard Lander have spoken of the South African variety of this bird, and the curious bunch of bristles which grow straight up out of the top of its head, now wide and bushy like the pompon of a hussar, and again closed up like a shaving brush after the latter has dried. It walks majestically in its gaudy plumage and scarlet wattle, as if in imitation of the African paradise crane, with whom it consorts in Ethiopian wilds, and to which it is said to be allied.

Its sometimes shrill and sometimes mellow note, mayhoo-oom! is said to be most frequently heard along the banks of the Zambesi River and Lakes Nyanza and Tanganyika. In height it stands something over three feet, measuring with wings spread about six feet from tip to tip. The body is gray, pale on the neck and darker on the scapularies, head black, with throat lappet red, which at certain seasons turns to brilliant scarlet. The wing coverts are white, with faint slate colored subterminals, sometimes rufous brown tipped; the tertials being striped with the same; breast and back pale buff and raven black. It builds its nest in the river swamps, ingeniously twisting the reeds and rushes in and out, thus making a basket-like structure resembling not a little what in military parlance is called a gabion, though of conical shape. The wattle—the fleshy excrescence growing under the throat—is well defined. The bunch of yellow bristles adorning the head is much sought after by the natives, who wear it in like fashion.

POSITIONS OF THE PLANETS IN NOVEMBER.

SATURN

is morning star, and an interesting object for observation, as he approaches the cluster of stars called Prasepe. He rises on the 1st at 10 h. 84 m. P. M. On the 30th, he rises at 8 h. 40 m. P. M. His diameter on the 1st is 17·4″, and he is in the constellation Cancer.

VENUS

is morning star. She is charming in the eastern sky, as she moves westward from the sun, rising nearly four hours before him at the close of the month. Venus rises on the 1st at 2 h. 59 m. A. M. On the 30th, she rises at 3 h. 5 m. A. M. Her diameter on the 1st is 37″, and she is in the constellation Scorpio.

MARS

is morning star, and may be found as a small ruddy star, southeast of Regulus. He rises on the 1st at 1 h. 31 m. A. M. On the 30th, he rises at 1 h. A. M. His diameter on the 1st is 5·2″, and he is in the constellation Leo.

URANUS

is morning star. He is in conjunction with Venus on the 24th, being 1° 7′ south. Uranus rises on the 1st at 4 h. 23 m. A. M. On the 30th, he rises at 2 h. 38 m. A. M. His diameter on the 1st is 3·4″, and he is in the constellation Virgo.

NEPTUNE

is morning star until the 21st, and then evening star. He comes into opposition with the sun on the 21st at 1 h. A. M. He is then opposite the sun, rising at sunset and setting at sunrise, and at his nearest point to the earth. Neptune rises on the 1st at 5 h. 52 m. P. M. On the 30th, he sets at 6 h. 11 m. P. M. His diameter is 2·6″, and he is in the constellation Taurus.

MERCURY

is evening star until the 17th, and then morning star. He reaches his inferior conjunction on the 17th, passing at that time between the earth and the sun, and reappearing as morning star on the sun's western side. Mercury sets on the 1st at 5 h. 39 m. P. M. On the 30th, he rises at 5 h. 21 m. A. M. His diameter on the 1st is 7·4″, and he is in the constellation Scorpio.

JUPITER

is evening star until the 8th, and then morning star. He is in conjunction with the sun on the 8th at 9 h. P. M., and so near him as to be invisible during nearly the whole month. Jupiter sets on the 1st at 5 h. 6 m. P. M. On the 30th, he rises at 5 h. 37 m. A. M. His diameter on the 1st is 29·4″, and he is in the constellation Libra.

At the close of the month, Venus, Mars, Uranus, Saturn, Mercury, and Jupiter are morning stars, and Neptune is evening star.

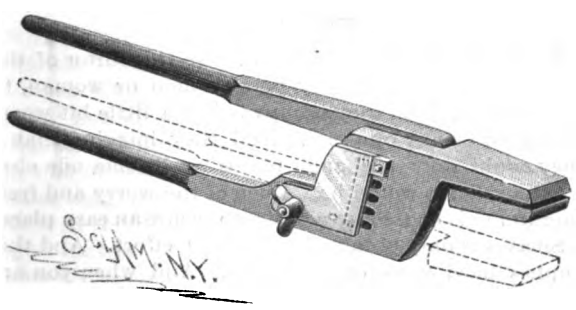
England and America.

This was the title of a lecture recently delivered in the trophy room of the American Exhibition in London by Mr. J. S. Jeans, secretary of the Iron and Steel Institute, and was the first of a series promoted under the auspices of the London Workingmen's Association. In the course of his remarks the lecturer said that the American resources were infinitely in excess of those of Great Britain, and unless the working population of the latter country were to atone for their deficiencies in this respect by greater industry and a more extended use of mechanical appliances, so as to economize labor and produce cheaply, they would not be likely to hold their position in the race. There was not much danger of American competition in manufactured goods for a long time to come. Fully 80 per cent of the exports from America took the form of raw materials. If American protection were continued at its present range, England would not have much fear as regards manufactures; but if the tariff were abolished, the industrial prospects of England would become very much blacker, in consequence of the enormous resources that America possesses for cheap production. The lecturer concluded by referring to the extent to which national prosperity and industrial prospects were affected by military and naval expenditure. He mentioned as a striking fact that was at variance with the general opinion of economists and politicians, that the United States had actually since 1861 expended 921 millions sterling on their army and navy, as against 626 millions sterling in England. But at the present time the annual expenditure on this account in Great Britain was £35,000,000 to £40,000,000 a year, as against about £13,000,000 in America, so that the English *per capita* expenditure was about 20s. as against 4s. 2d. in the United States. America had, however, the further advantage of having only a comparatively small handful of men withdrawn from industrial and productive occupations for military purposes, whereas England has over 200,000 of the flower of its manhood that were not only producing nothing, but hanging like a dead weight around the neck of the productive community.

ment by wire rods connected by eyes to the case at one end and engaging by hooks with eyes at the other end, as shown in the detail views. Supporting braces are connected to each end of the cases, and they are arranged to enter properly located recesses in the standards of the frame, in order that the cases may be held extended, as shown in one of the views, when any one or more of the shades may be drawn down for inspection. The strips forming the recesses which receive the shade fixtures break joint with each other, so that the pendent portions of the shades will hang in distinct planes.

IMPROVED ADJUSTABLE TONGS.

An improved form of tongs, with which the operator is enabled conveniently to hold a large or small object,



MANNES' ADJUSTABLE TONGS.

is shown herewith, and has been patented by Mr. William H. Mannes, of No. 1720 Blake Street, Denver, Col. One of the tong parts carries the pivot pin, and the other has a number of parallel slots leading into a cross slot, a guard plate being held on this slotted tongue part by means of a bolt with a winged nut screwing down on the plate. With the adjustment shown in the illustration, the jaws will hold very small objects. To hold larger articles, the winged nut is unscrewed, allowing the guard plate to swing downward, uncovering the cross slot, when the operator can move the shank of the pivot pin carried by the other tong part to any of the other slots, thus altering the position of this tong part and its jaw to a position such as shown in dotted lines, when the guard plate is again swung upward and screwed in position, engaging one of the sides of the square head of the pivot pin.

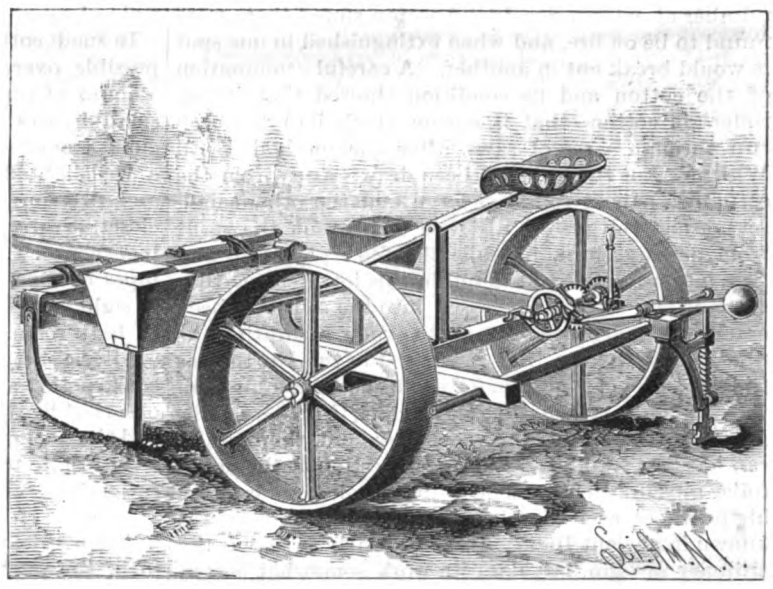
A SWITCH OPERATED BY THE LOCOMOTIVE.

A novel construction of railway switch, operated by the locomotive without any attention from the engineer, and with which there is no necessity of applying to the locomotive any fixtures, is represented in the accompanying illustration, and has been patented by Mr. James B. Suffern, of Hillburn, Rockland County, N. Y. The movable rails are attached at their free tapered ends to a switch bar, connected with a switch stand, the bar having a slot near its center. To one of the ties, a short distance therefrom, is pivoted a curved track lever having a forked end which embraces the switch bar, being connected therewith by a bolt passing through the slot. The convex side of the curved track lever is normally in contact with one of the rails, so that a car wheel passing along in either direction would throw the track lever away from the rail. Upon the side of the switch bar is pivoted a weighted cam lever, embraced by a yoke, connected with a slide placed on the switch bar beyond the forked end of the track lever, and this slide may be locked in position away from the slot, to permit of the free movement of the track lever without moving the switch bar, or it may be locked against the side of the track lever, when the latter cannot be moved without moving the switch bar. When the weighted cam lever at the side is raised, the track lever is free; but when this weighted lever is depressed, the track lever is locked to the switch bar. A short distance beyond the point at which the curved track lever is pivoted is placed a vertical shaft, with an arm projecting into the path of the locomotive pilot and another arm connected by a rod with a toggle joint operating the weighted lever to move the switch bar. A train approaching the switch from the opposite direction passes over it in the usual way, leaving the main track continuous. But when a train is approaching as indicated in the engraving, the pilot of the locomotive engages the projecting arm connected with the rod which trips the toggle joint and allows the weighted lever to fall, and, the track lever being then locked with the switch bar, the engagement of the wheels with the track lever moves the switch rail to render the track continuous, and the train may then pass over the switch in safety without danger of being run on the siding.

AN IMPROVED CORN PLANTER.

A novel construction of marking and dropping devices for a corn planter is shown in the accompanying illustration, and has been patented by Mr. Isaac H. Athey, of Marion, Ark. On the drive wheel which operates the dropping and marking mechanism is a gear wheel meshing into another gear wheel mounted loosely on one end of a short shaft held in bearings on the main frame. Sliding on and rotating with this shaft is a clutch, connected with an upright shifting bar, for moving the clutch into or out of contact with a ratchet wheel, whereby the forward movement of the drive wheel imparts a rotary motion to the short shaft. On the latter is a cam wheel with sidewardly projecting arms, which, with the rotation of the shaft, operates a lever connected with the dropping bar working in the seed boxes in the usual manner, the lever being constantly shifted from one side to the other by the cam wheel, thereby imparting a sliding motion to the dropping bar. On this shaft is also held, by set screws, two curved arms, extending in opposite directions, which, with the revolution of the shaft, engage by their outer ends one end of a lever fulcrumed on a bar secured to the main frame. This lever carries a weight at its rear end, and just forward of the weight is a sidewardly extending arm, with a friction roller operating on the marking bar. The latter is held to slide in a bracket secured to either of the side beams of the main frame, the upper arm of the bracket having an elongated slot, and its lower arm carrying a friction roller resting with its rim against one side of the marking rod. A spring secured to the side beam of the main frame presses with its free end against one side of the marking rod, on which also is a coiled spring. As the machine is operated by its forward movement, the arms on the short shaft lift the weighted lever, and cause it in dropping to strike the top of the marking rod, forcing the latter downward until its foot makes an indentation in the ground at the point where the corn was dropped by the dropping bar.

As the machine travels forward, the marking rod swings on its fulcrum, and is lifted and held in vertical position again by the springs, by the time that the weighted lever has been raised by one of the arms on the short shaft, and the marking rod is again pressed downward at the point where the corn was dropped. The machine is simple and durable in construction and very effective in operation.



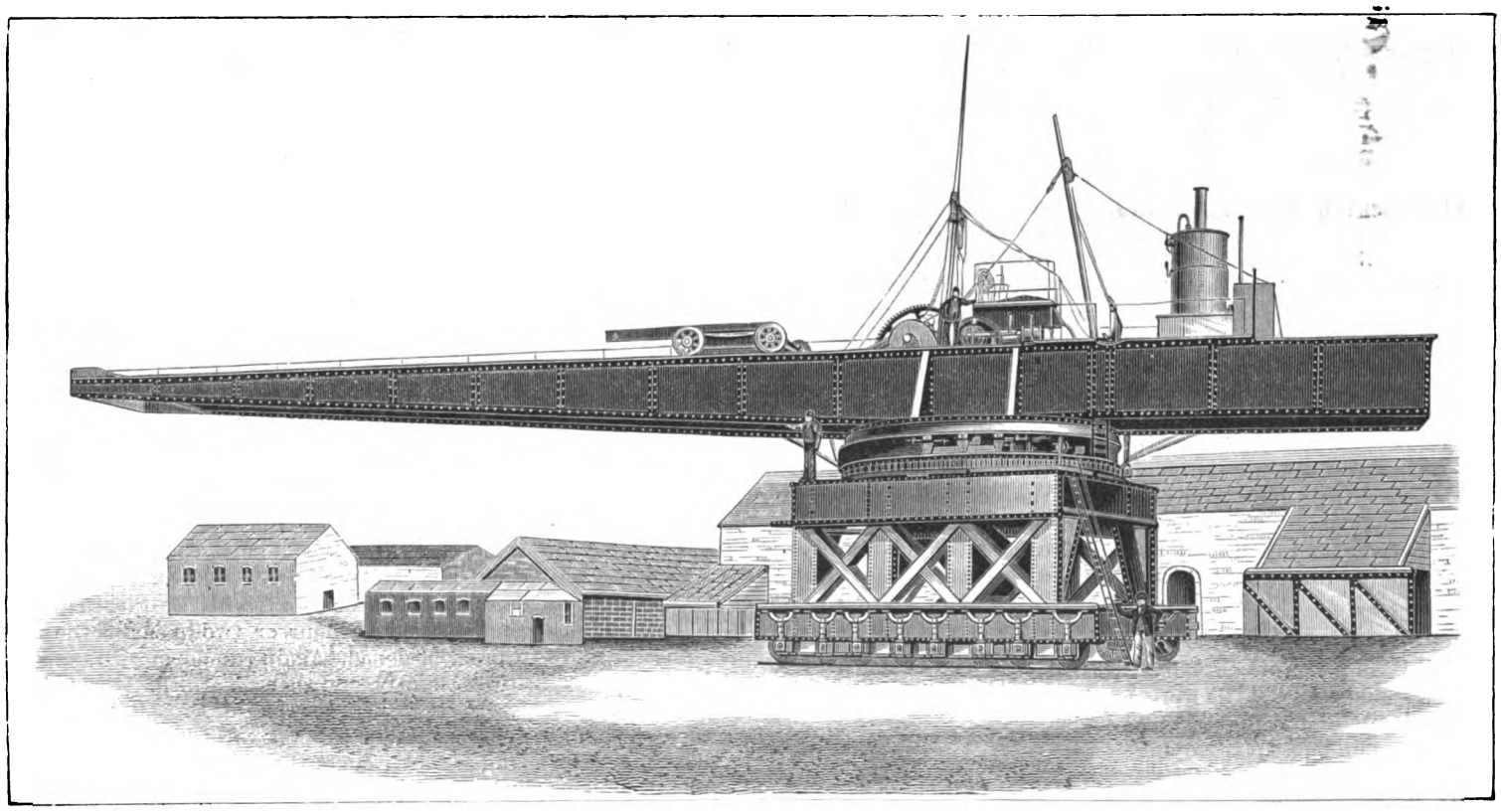
ATHEY'S CORN PLANTER ATTACHMENT.

Euphorbia Rubber.

Up to a comparatively recent date, small parcels of this gum have occasionally appeared on the market, but for some time rubber manufacturers could not succeed in satisfactorily making use of it. At last, however, a method has been discovered which renders the gum available for mixing with various kinds of India rubber to the extent of 50 per cent. A piece of vulcanized rubber containing 50 per cent of the euphorbia gum has been tested for some time in an exposed position on a roof, and it has kept better than a similarly exposed piece of ordinary pure (vulcanized) rubber. Mixed with gutta-percha, it prevents the latter becoming brittle. Washers made with 30 per cent of this gum and vulcanized rubber stand well and retain their elasticity. Tubing for supporting high pressures is far less likely to split and crack when a proper quantity of euphorbia gum is employed.

NEW ALL-AROUND CRANE.

We illustrate a new all-around crane by Ransomes & Rapier, Ipswich, designed to lift a test load of 33 tons at a radius of 67 feet; the maximum radius which can be obtained with it in ordinary work being nearly 80 feet. The *Engineer* says: "The machine is self-propelling, being borne on a carriage which is mounted with 32 springs on 16 wheels, and has a gauge of 21 feet and sufficient height to allow a railway train to pass under it. The various motions of lifting the load, traveling, altering the radius, and turning are all performed by the steam engine."



IMPROVED ALL-AROUND CRANE.

Curious Fires.

In a late interview with a gentleman identified with the insurance interests, and one who has had a wide experience in the insurance of mills and manufactories, the attention of the reporter for the Boston *Commercial Bulletin* was called to some instances of curious fires which had taken place under circumstances and in situations hitherto deemed impossible.

Cotton in bales was always supposed to be free from spontaneous combustion until lately, when a case was discovered in a storehouse in northern New Jersey. A number of bales of Sea Island cotton stored there were found to be on fire, and when extinguished in one spot it would break out in another. A careful examination of the cotton and its condition showed that it was roller-gin cotton—that is, cotton which had not been run through a set of saws, after the method of Eli Whitney, but the lint had been drawn away from the seed by a pair of rolls, one large and the other small, set at just the proper distance to prevent the seeds from passing through, while the fiber passes on and goes into a bag. It was found in this lot of cotton that some of the seeds had passed into the rolls and been cracked, which caused the oil to exude, saturating the fiber, which, by the time it arrived in the North, was thus in a proper condition for spontaneous combustion. Careful and extensive inquiry among Northern mills failed to reveal any other such case, and, therefore, it can hardly be taken as a strong objection to the use of roller-gins in general. The ordinary roller-gin is a prehistoric tool, as it has been in use since cotton was known in ancient India. It is not nearly so fast as the ordinary saw-gin, but does its work somewhat better, and with the least possible injury to the fiber, and is therefore preferred for Sea Island cotton, which is of long fiber and almost double the value of the ordinary grades.

Another curious and inexplicable fire was one which occurred in a boiler room in a central New Jersey town. The room was 72×80 ft., with masonry wall 18 ft. high, covered by a roof of 1 inch plank, slated, and supported by wooden trusses. The boilers were set in batteries, with clear spaces all around them. They were 8 ft. from the trusses and 16 ft. from the roof. One Sunday morning, on his way to church, the mill superintendent visited the boiler room, and found there only the fireman, who was engaged in setting in new gauge glasses. There had been no fire under the boilers since 11 p. m. Saturday, and the fireman had thoroughly inspected the premises. The superintendent did likewise. Both left at the same time, and got about 1,000 feet away when they saw flames break through the roof, which was damaged so much that a new roof was necessary. This case was thoroughly investigated, but no satisfactory explanation of the fire, which had taken place under such apparently impossible conditions, has been made.

And a third peculiar instance was a fire started by some cotton waste, which, in clearing up a mill, the engineer put in front of a boiler, where it would be convenient for the fireman to burn in the morning. During the night, the waste got on fire from spontaneous combustion, setting the kindling on fire, and succeeded in generating sufficient steam to cause the boiler to blow off, scaring the watchman, who naturally thought the boiler, which he knew had been left without a fire, was going to explode. Still another curious fire was that caused in the picker room of a jute mill, by a man driving a nail in the ceiling. The nail glanced off and was struck by the rapidly working beaters, and the sparks caused thereby resulted in a serious fire.

Reports to the manufacturers' mutual insurance companies show that about two fires a week are put out by automatic sprinklers. In these reports there is only one instance of a fire getting out of a room protected by automatic sprinklers, and it is a somewhat peculiar case. The fire started under a mule-carriage in a dirty mill, and was thus protected from the flow of water from the sprinklers, which were of old construction and not so sensitive as the later ones, and therefore did not work so quickly. The fire worked its way under the mule-carriage, and then to an open and unprotected staircase, and so throughout the building.

Sanitary Drainage of Buildings.*

Mr. Paul Gerhard, C.E., of New York City, has issued, through D. Van Nostrand, a useful little work on the above subject, which is useful for plumbers and all persons about to build a new house, embodying notes on recent practice in sanitary drainage. The author, who is an authority on sanitary matters, and whose works on the subject of house drainage and plumbing are well known, has condensed a great deal of information in this little guide for architects, engineers, and others. With the help of it one may easily prepare a plumbing or drainage specification. The leading requirements of plumbing work will be found briefly mentioned, and the second part, "Maxims of Plumbing and House Drainage," embodies in terse sentences the rules to be observed on planning. He commends the following rules to all architects:

"Avoid a useless multiplication of plumbing fixtures. Let the amount of plumbing work in a house be reduced as much as possible. Above all, avoid locating fixtures in unoccupied or spare rooms. Do not place plumbing fixtures of any kind in sleeping rooms, nor even in unventilated closets adjoining them. Always arrange fixtures so as to be concentrated as much as is consistent with convenience in use, in compact groups. Have as few vertical lines of pipe as possible. Avoid long horizontal runs of pipe.

In small cottages place the bath room as nearly as possible over the kitchen, in order to reduce the amount of piping and to simplify the whole work. In small houses it is preferable to separate the water closet from the bath room, and to give to each of them a well lighted and ventilated apartment. In toilet and dressing rooms adjoining bed rooms, the water closet, lavatory, and bath may be, however, arranged together. . . . Place all soil, waste, and supply pipes outside of walls or partitions. Let pipes pass in sight through closets, and have them fully exposed in bath rooms."

After a list of such rules the author describes the construction and lays down general conditions to be observed by the plumber, the materials to be used, and the weight of lead pipes for different pressures. Referring to wrought iron pipes, the following specification is given for soil, waste, and vent pipes:

"To be of standard wrought iron pipe, having a uniform thickness of not less than one-quarter of an inch, the pipes to be lap-welded and proved at the iron mills to 530 pounds per square inch by hydraulic pressure, to be coated after being heated with a preparation of coal tar and asphalt (or to be treated with the Bower-Barff or other rustless process); fittings for soil and waste pipes to be protected against rust by the same process as applied to the pipes, to be tapped truly straight, and to have a strong shoulder."

Mr. Gerhard furnishes concise descriptions of traps, supply pipes, stop cocks, valves, solder, pig and sheet lead, fixtures, cement, putty, sand, and mortar. The workmanship is next described, such as pipe joints, etc. Test of the work during construction and after completion and suggestions for a sanitary code are included in this compendious little book, which will be a useful *aide memoire* to the professional man. The memoranda of cost will be of service to the American architect and builder.

* The work may be had at the office of the SCIENTIFIC AMERICAN. Price, 50 cents.

Electricity as a Motive Power.

In a recent lecture before the Finsbury Technical College, London, by Professor Silvanus P. Thompson, D.Sc., on "Electricity as a Motive Power," the lecturer commenced by saying he wished to draw attention to one of the novel sciences which was now taking root here. The science of electricity, the lecturer added, originated in England, but we had allowed America, Canada, and even Japan to leave us far behind, the reason being that we were tied down by prejudice and even stupidity, and thus prevented going ahead. It was said that the countries he had mentioned were protected by their laws; but if protection made them go ahead, they would do so still more without protection, and his impression was that in a few years the United States would wipe out protection altogether. There were plenty of places in America where they had no gas company, and would not have one, but where every house was lighted by electricity. There were 700 local electric companies in the United States, who distributed motive power to the districts around; and England might count on going ahead as soon as local factories were established here, from which the electric power could be supplied and distributed wherever required.

The lecturer then explained the principle upon which various electric machines were constructed, illustrating his remarks by numerous experiments, showing how the motive power was generated by the application of the magnet. Mr. Sturgin, to whom was due the discovery of the electric magnet, demonstrated that it caused a circular current through insulated wire round a piece of iron, by which the iron itself became magnetized and an alternative power produced. This discovery was gradually developed as the science became more known. The question of importance was how to produce electricity cheaper than by using zinc, which was twenty-four times dearer than coal. Dr. Faraday discovered a new way of getting a current, simply by passing magnetism in or out through a coil of wire round a piece of iron. These currents could be used for all sorts of purposes, and the current by this means was produced at a much cheaper rate than by zinc. It was possible to transmit power for 100 miles by a system of wires, and to work engines, etc., wherever wanted. He strongly advocated the establishing of local factories for the supply of electric power, and referred to Rochester, N. Y., as having such local factories and hiring out the motive power at cheap rates. They put up the machines where wanted, and charged for one horse power, working six days from 7 A.M. to 6 P.M., 1*l.* 16s. a month, and two or more horse power upon easy terms. There was no fire required, or trouble or expense, but just put on or off the connection as the power was wanted.

In America there were 30 of these local factories. One company sends out 50 machines per week, of various sizes. Thus manufactories were supplied with motive power and light at small expense. It was the wretched Lighting Act in this country which stopped the progress of electricity. Then there was the social effect it would have. The advantage to small men, who could not afford to pay for steam, was that they could hire one of these machines for 1*l.* 16s. per month, and thus prevent the aggregating of operatives together in large workshops, where no man was his own master. All kind of work would be facilitated.

Easy Places.

It seems nothing but natural, says the editor of the *St. Louis Miller*, for every person, man or woman, to think the position they occupy is just a little bit worse than that of any one else. And they imagine that if they could only exchange places with some one else, what a relief it would be. Much of the worry and fretting in life is caused by a desire to secure an easy place.

Success is only obtained by earnest effort. And this implies hard work of some kind. And when you are doing hard work, you certainly cannot be considered as having found an easy place. It is those who do not make a success that are always on the lookout or hunt for an easy place. And after they find themselves in positions where a little earnest effort would considerably improve their conditions, rather than make the effort they allow themselves to make an easy place for their individual comfort, and let the chance slip. Many a young man, in an effort to find an easy place, has allowed opportunities to pass by which, if he would have taken them up and added a few years of hard, well-directed labor, would have placed him in a condition where, if he desired, he might take upon himself an easy place.

One item should by no means be overlooked in this, and that is that many places are like the ones you are occupying, that is, they are very deceiving. Others imagine that you are having a very easy time as compared with theirs, and they would gladly exchange with you, while at the same time you are thinking the same with them.

We often make our lot in life not only harder, but considerably worse than it really is, by continually looking at the dark side. We try to see all the drawbacks rather than trying to better our condition all the while, and this at least adds nothing to it. The fact is, if life were all sunshine, if we all secured what we might consider as easy places, it is very doubtful if we would appreciate it as fully as we do our present blessings. Better wear out than rust out. Life can be made much pleasanter if we would try to make the best of everything, and then when we are able to better ourselves, we are in a condition to enjoy better. It is an impossibility that each and every one of us should be able to secure a place that we might consider as easy. Added to this is the fact that much that we see is deceiving, and that if we fail to find what we are seeking in making a change, we are only breeding discontent instead of bettering ourselves.

It is certainly to the interest of every man to better himself or his condition when he can do so honestly. This is what, to a certain extent, we are all aiming to accomplish, but we will not be able to reach this if, instead of earnest, faithful work, we devote our energies to seeking out and obtaining an easy place.

Filling Wood and Removing Old Paint.

The *Carriage Monthly* tells its readers how to remove varnish from a panel after it has pitted, and has stood so long that it is too hard and dry for turpentine to soften it, but too wet for the stone to rub it. A good way is to run over it lightly with spirits of ammonia. Do not let the ammonia remain too long on the varnish before you use the scraper on it, as it will be likely to eat through and affect the under coats. The object to be gained is only to take off the pitted coat. After removal, wash off with Castile soap and water. Let stand an hour or two to enable the under coat to get hardened. Again rub down with rag and pumice stone lightly, and then revarnish. It would be better, if the time will warrant it, to coat over again with a light wash of rubbing varnish, to guard against a possible repetition of the pitting.

From the same source we are told how to stop the grain in polished wood with simple ingredients.

Take a small quantity of white beeswax, melt it down, and, while liquid, mix with whiting. As it gets thick, keep adding boiled oil until you have it as you wish it. When using it, sheet the wood over solid. Let stand until the next day, when you can remove the surplus by using No. ½ sandpaper. It is cheaper and easier than the shellac, and can be leveled sooner, leaving nothing but the pores or grain of the wood filled, which is better than having your wood all stained up with the shellac.

Correspondence.

A Correction.

To the Editor of the Scientific American:

In your recent notice of "Food Adulteration," by Dr. Battershall, you designate that gentleman as chemist in charge of the U. S. laboratory at this port. As I have held such position for the past seven years, and still hold it, and as the error, though inadvertent, may be misleading, I beg that you will correct it.

EDWARD SHERRR, Chemist in Charge.

U. S. Laboratory, Port of New York, Appraiser's Office, 402 Washington Street, October 12, 1887.

Self-mending Insects and Snakes.

To the Editor of the Scientific American:

In the "Correspondence" department of September 24 was a communication from Oliver White, secretary of the Peoria, Illinois, Scientific Association, headed "Self-mending Snakes," in which he relates of breaking one of these reptiles into pieces from one to two inches long, from the anus to the tip of his tail—two-thirds of the whole length of the way—then placing a cage over him. On returning to the place twenty-four hours after, the snake was there, sound and whole, in full length.

A similar operation is performed by the insect known as the earwig. One resting on a board was cut in two with a knife, when the head half crawled away about a foot, and, after making a circuit, came back to the tail half, butted against it, and was again united with it, when the severed insect became whole—a perfect, living, moving object. Can you or any of your readers, Mr. Editor, give me a scientific reason for or an explanation of this most marvelous operation of the self-mending snake and the earwig? Are there any other insects, reptiles, or living objects that do the same?

CHARLES MARSEILLES.

Exeter, N. H.

In the "glass snake" and other low orders of life, repair is usually by *primary adhesion*, by *scabbing*, or more rarely *immediate union;* or it may, in a sense, be a medium between the two former. Creatures with three-chambered hearts and sluggish (cold) circulation retain vitality in severed tissue much longer than those possessed of a four-chambered heart and quick, warm circulation; and to even greater extent is this true of white-blooded insects, without complete circulatory apparatus. Here reparative material is poured out, undergoing changes similar to those in primary adhesion; and the wound cicatrizes rapidly beneath the scab formed by the highly plastic serum of the blood effused on the surface, and which coagulates with extreme rapidity and firmness in the lower orders of creatures. The scab affords support, the embryo cells with the plastic lymph being the medium of repair. The process is identical in all grades of life, and in all tissues, whether bone, muscle, integument, tendon, capillaries or nerves, and depends solely upon the blood supply and the capability of the nervous system to provide this nourishment. Severed fingers have successfully been reunited to the hand in the human subject; bits of muscle, integument, or scalp grafted; teeth transplanted; and even the spurs made to grow in the comb of the same barnyard cock. The processes are precisely the same as in the reunion of a severed portion in reptiles or insects when the latter are led by instinct to approximate the separated portions of their economies, and to await the exudation and "sealing" that will insure permanent union. The exudation about the wound gives support, exactly as the "provisional callous" forms a false splint holding the bone in place until reparative processes shall reunite the fractured surfaces. Had the *opheosaurus* of Mr. White been reunited *without* exhibiting traces of the injury, we might be justified in deeming it phenomenal, or in believing the gentleman had been unconsciously deceived; but under the circumstance, he narrates nothing but what is an every day physiological occurrence, curious only as the severed digit, when replaced and healed, is curious! But withal his observation is valuable, since it adds one more link to the chain that must eventually strangle superstition, and silence "doubting Thomases" possessed of narrow minds, and race egoism, that can conceive of nothing less than *man* as an object of nature's fostering care.

G. ARCHIE STOCKWELL, M.D., F.Z.S.

Port Huron, Michigan.

River and Harbor Improvement.

At a recent meeting of the Engineers' Club of Philadelphia, Prof. L. M. Haupt suggested a plan whereby he proposed to create a channel, sufficient to meet the demands of commerce, upon the following principles:

1. If the *bottom velocity* of a stream be increased to the limit required by the character of the material forming its bed, it will scour; if diminished, it will deposit.

2. If the *momentum* of a stream be suddenly arrested by an obstruction placed in its path, a reaction will be produced, its head will be increased, and the bottom will be scoured out.

3. If the *volume* of a stream be partially deflected by a trailing wall, from one side of a cross-over bar to the opposite side, the current over the bar will be quickened, and the crest lowered, above the line of the works.

4. If the *form* of the cross section of a stream be modified by cutting at one point and filling at another point of the same section, so that the area is not changed, other things being equal, the discharge will not be materially affected, and the part so deepened will remain open.

5. If a stream be compressed laterally into a smaller section, its velocity head near the banks will be increased, while that at the center will be diminished, and consequently the channel will be bifurcated and the deepest water be found near shore.

If, by the application of these laws of flowing water, a channel, sufficiently wide and deep for navigation, be cut across a bar, it will be self-sustaining, and cost much less than if the entire bar were disturbed by the usual lateral dikes or by dredging.

Automatic Car Couplers.

At the convention of the Master Car Builders at Minneapolis, last summer, the committee on automatic freight car couplers made their report, from which we take the following:

It has long been thought absolutely necessary that there should be a considerable amount of loose slack in the coupling of cars to enable the starting of trains; and while it has been tacitly admitted that there were some disadvantages incident to the presence of this slack, due to its tendency to break drawbars and draught rigging in starting and stopping trains and in pulling through sags and hollows in the track, it was never realized what an enormous evil the presence of this slack became on long trains until these trials were made. It was then found that the shocks were so terrific that it was absolutely necessary to block the links; without blocking it was impossible to live in the rear car. Stock could not stand on their feet in such a train, or freight be prevented from shifting except in the case where brakes were applied to each car by electricity. There was only one train brake present wherein the brakes were applied in this way, and even with this brake it was found necessary to block the links in making the break-away tests, as it was then impossible to use electricity on the rear portion of the train. At best this special train could not be considered as representing the usual conditions of service, because the cars were all of one standard and were all new and in perfect order. If the train had been made up miscellaneously of home and foreign and old and new cars, as is usual in service, it is fair to assume that the absence of shocks would not have been so apparent. The tests therefore conclusively show that power train brakes cannot be successfully introduced unless close couplings are used, except in the case where they are applied electrically to every car in the train, and no break-aways are expected. The presence of loose slack having been found to be so dangerous at Burlington (1887), the brake committee determined to dispense with it in so far as possible in making their tests. Before doing so they ascertained by actual experiment whether its substitution by spring slack would prevent the starting of an equal number of cars, as was generally believed. In this special test they demonstrated, both by observation and dynamometer car records, that the severest pull on the engine comes immediately after all the cars in the train have started, and that an engine will start more cars than it can pull; loose slack and spring slack were both shown to assist in moving the train for the first few feet, but the heavy pull on the engine comes after the slack is all out of the train. They found that there was very little difference between the ability of an engine to start a train with loose links or links blocked. Going up a grade of 53 feet to the mile, it was found that a train could be started with greater ease with the links blocked than with the links loose; this was due to the fact that with the loose coupled train the engine would have had to start up cautiously in order to prevent the train from breaking in two from the jerks that would follow before all of the slack was taken up. With a close coupled train this care was not necessary, there being no loose slack, and it was possible to start with a wide open throttle. It was also found that the riding of the train was very much improved by the close couplings, as might have been expected from our experience with passenger cars. It should be remarked here that no form of couplings, loose or closed, entirely abolish shocks of stopping in emergencies by train brakes, unless they are electrically applied, but that close couplings are vastly more advantageous than loose couplings; they cushion the shock and prevent the sharp and distinct blows found with loose couplings. A complete elimination of shocks is a question of brakes, not of couplers.

We have now, therefore, reached the point in the solution of this problem where we can say that the question which presented itself at this time last year with reference to the value of slack has been decided, and that consequently the choice for this association to make is again narrowed down by a great step from between the loose link and the hooks coupling vertically to the best sub-types of the hooks.

The adoption throughout the United States and Canada of any single individual coupler which would not interchange with any others we would consider most disadvantageous, for the reason previously set forth; neither could your committee recommend any coupler as the best, and we further think it would be impossible for the railroads to agree upon one coupler.

The Janney type of coupler, including the Janney, Dowling, Thurmond, and we think ultimately the Barnes and Hien, is the type to which the evolution of the subject has brought us; it affords a close coupling with spring slack; it makes it possible to use power train brakes; it already includes several couplers and opens the door to more, so that no railroad company is restricted to purchasing from one manufacturer; it incorporates more of the practical requirements of a perfect automatic train connection than any other type or form of coupling. It is not a new, unknown, and untried coupler. It has been used in the Janney form very extensively on some of our largest roads in the North and West, and in the Thurmond form in the South. Its most serious defect is in strength, and the question that now presents itself is, "Can this defect be remedied?" We consider that it can, and the further development of the problem must be in this direction, and what we say here on the subject of strength is applicable to all forms of couplers, no matter of what type. This development can be accomplished by following three paths: First, increase the dimensions; second, improve the character of the material; third, protect the coupler by deadwoods or, better still, spring buffers. The development in the line of the first path must stop before interchangeability is destroyed. This limit, except possibly in some minor details, has practically been reached. In the second path, much remains to be done. Its advance has already been marked by transitions from cast to malleable and wrought iron, and in some cases from malleable iron to cast steel. Experiments are now being made on a large scale with manganese steel, and we are hopeful that the general attention being given to the improvement of material will result in valuable discoveries. The third path, protection, promises the most important benefits, although we believe all three paths should be followed. It is daily becoming more apparent that we cannot consistently expect the small, detail parts of a coupler to act as a buffer between such ponderous bodies as heavily loaded freight cars brought in sudden conjunction. Though these parts are designed to operate together in forming a coupling, they cannot successfully perform this function in a satisfactory manner and be the first to receive the whole force of the blows of service. These shocks should be received immediately upon that portion of the car strongest to resist them—the end sills, backed by all the floor framing in the car. Another line of development which should be mentioned here is the simplifying and standardizing of the levers, rods, and chains used for operating the various forms of couplers.

Your committee feels that the status of the problem at the present time, as here stated, warrants them in making the recommendation that this association recommend as a standard form of coupling the Janney type of coupler.

There is an urgent necessity that the association should act at this time, either in the line that your committee has recommended or in some other. Railroads have reached a point where there is an absolute need for an automatic train coupler; it is vividly apparent that a coupler must be introduced to save the life and limb of the employes; decrease the cost of operation by enabling the use of power train brakes; to do away with the shocks of stopping and starting, and to eliminate the damages of bunching trains in sags and hollows. The public demands it, the safety of the train men demands it, and the economical operation of railroads demands it.

In view of the facts already mentioned, that the best type of coupler is still undergoing development in matters of strength and simplicity, and that may railroads are not ready to adopt it until it is better perfected, your committee would further recommend the continuance or use of the Marks, Ames, and McKeen couplers as the best representatives of the loose couplers.

Walnuts as Food for Turkeys.

A writer in a London paper says under this head: I stated last week that in former days tame turkeys were fed with walnuts to give them the taste of wild turkeys. In Italy turkeys are always fattened with walnuts. Thirty days before a turkey is to be killed, one walnut is stuffed down his throat. Each day he is given an additional walnut, and on the twenty-ninth day he has twenty-nine walnuts. He is then immensely fat. I have often wondered, adds the writer, why our turkey breeders do not adopt this plan.

HARVARD OBSERVATORY AND THE HENRY DRAPER MEMORIAL.*

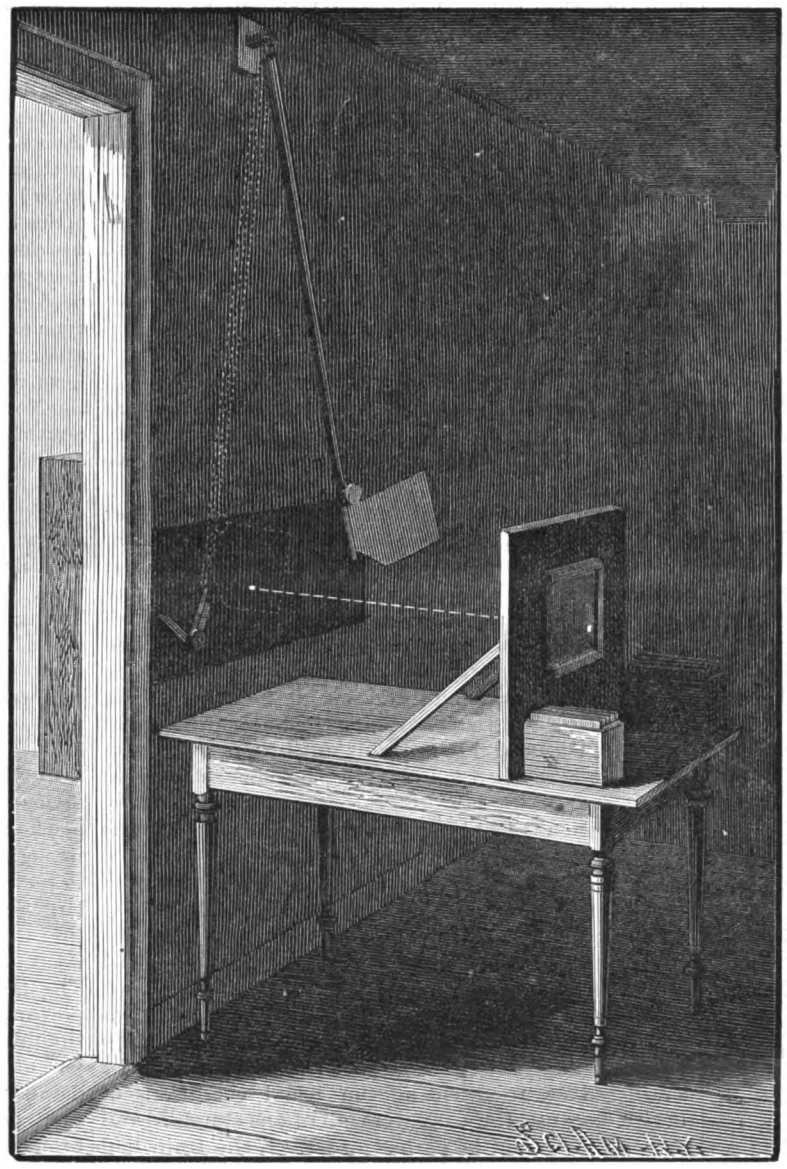
II.

We have seen how the general photographic operations in photographing stellar spectra are carried on. One detail of work affecting the test of the plates remains yet to be described. Every plate before exposure in the photographic telescope receives the action of light over a small square area of a beam, which is impressed upon it, with definite exposure. The apparatus for thus standardizing the sensitiveness of plates is illustrated here. Back of a wall or partition a lamp is placed. Directly in front of the lamp, and a little above its wick, a small square hole is cut through the partition. On the other side of the partition, which forms a portion of its wall, is a dark room. Within this room a pendulum is hung with its point of suspension above the square aperture. The pendulum has a period of oscillation of one second, from end to end of its arc. A catch is arranged to hold it well to one side. Thus held it completely covers the little square opening. If released it swings away, and just as it passes the central line exposes the opening. It then continues its course to the end and begins to return, the hole being open all this time. As it reaches the center of its arc on the return swing, it again shuts off the light. The bob carries a screen of such shape as to effect this operation. The opening is shielded during one-half of a double oscillation and exposed during the other half. Half of a double oscillation gives an exposure, therefore, of one second.

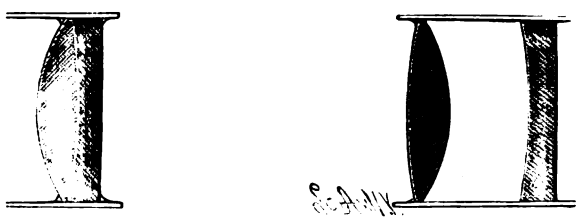
Every plate before use is tested in this apparatus. The lamp, which is treated as a standard source of light, is lighted and accurately adjusted as regards height and distance from the aperture. The pendulum is held back in its catch, covering the hole so that no light passes through.

A plate is set up in a support opposite the opening and about three feet distant. The pendulum is now released; it swings across and back as just described, and on its return is caught automatically. The plate is removed and another put in its place and the operation repeated for it. After this they are ready for exposure in the telescopes of the observatory. When they have been exposed they are developed, and then only simultaneously with the spectra the image of the spot of light appears.

Every plate thus bears upon it near a corner the signature of one second's exposure to a standard source of light. Those of our readers who are familiar with gas photometry will recognize a modification of the Methven screen in this lamp and opening. On the first page of this paper we illustrate



APPARATUS FOR STANDARDIZING SENSITIVE PLATES.



VISUAL AND PHOTOGRAPHIC COMBINATIONS OF LENSES.

the 11 inch telescope. It is now used altogether with the 8 inch Voightlander shown in a recent issue, in carrying on the work of the Draper memorial. Its objective was made by Clark, and is a purely visual one. To make it available for stellar photography, a supplementary photographic lens was made, also by Clark. This is placed in front of the regular objectives, and corrects them for the actinic focus.

The arrangement is similar to the one adopted for the Lick telescope. The visual objective for this great telescope has been made and put in place in the observatory in California. The photographic lens is yet in the manufacturer's hands. An extra cost of over ten thousand dollars has to be incurred in supplying it.

The point is thus dwelt on because the Clark Brothers are at present working out a combination by which the regular members of a visual objective can be used for celestial photography. The crown glass lens is ground more convex on one side than on the other. The flatter side is in contact with the flint glass lens when the combination is arranged for visual use. For photography, the glasses are separated, and the crown glass lens is reversed. Thus two lenses of the regular achromatic combination are made to do the work of three. Had this combination been invented in time to have been applied to the Lick objective, the expense of the photographic lens would have been avoided. The new combination was devised by Prof. Pickering and the Clark Brothers.

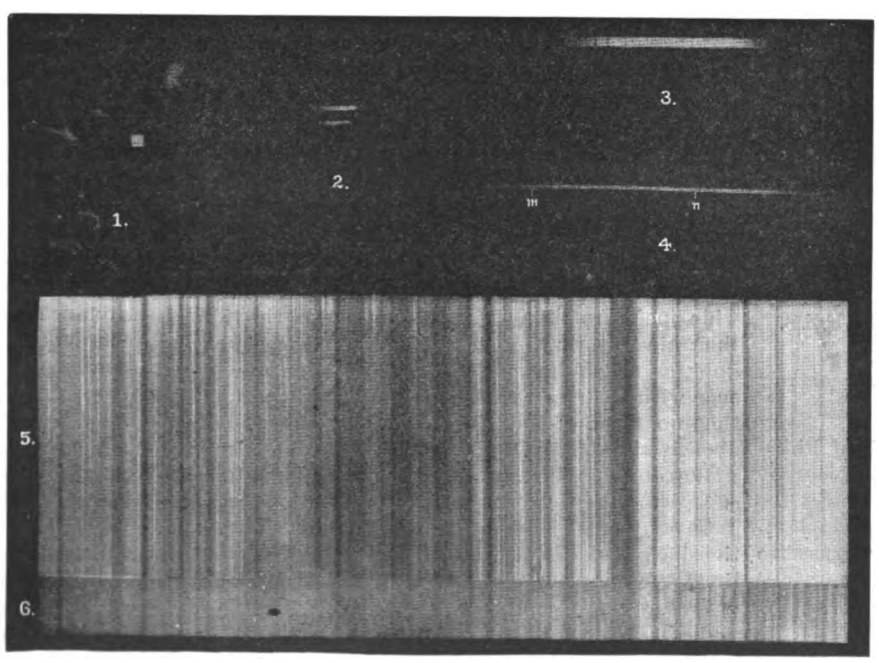
The eleven inch telescope is provided with a battery of four prisms. Each member is mounted in a brass frame, which slides into place in the large box like a drawer. When all are combined, the box and battery of glasses weighs one hundred pounds. It is a foot cube in size. It is carried by the telescope in front of the objective.

At its other end the telescope is provided, as usual, with a finder. Owing to the refraction of the prisms, the field of the glass is far from its normal one, and the finder is set at an angle with the main axis equal to the angle of refraction of the prism. The tube is mounted in the ordinary eccentric way. It is so perfectly counterpoised that it can be pulled about by the hand ropes with ease. It is driven by clockwork controlled by electric impulses from a pendulum in the laboratory building. The pendulum, in its swing, sweeps, with a point of platinum below its bob, through a globule of mercury, completing at each swing an electric circuit. The closing of this circuit works an escapement on the base of the telescope. Without this escapement the clockwork would drive the telescope a little too fast, as it is controlled and, to a certain extent, governed by a vane wheel. The electric escapement has only to impart the last or residual correction to its movement. The building containing the telescope is a simple wooden structure, with dome, which rotates on cast iron rollers. One person can readily turn the dome by direct pushing against the handles, no tackle or gear being required. The two instruments described are soon to be supplemented by some of Dr. Henry Draper's reflectors, a twenty-eight and a fifteen inch one. The latter is one of the most perfect mirrors constructed by the great astronomer. With it he took his photograph of the moon. When these are mounted, it is intended to keep at least three telescopes at work all night.

For the spectra of bright stars near the equator, an exposure of five minutes is given. For the spectra of faint stars, an hour is the period. Each plate contains a number of spectra. In one case over three hundred appeared. The telescope is made to trail the spectra to a width of one millimeter (1-25 inch) as near as may be.

If the work progresses as well as it promises, most important results may be looked for. Thus the motion of stars directly toward or away from the observer it is hoped may be determined with great exactness by the displacement of the lines of their spectra. To carry out such work, a standard is needed to refer the lines to. The ordinary spectrum is of course inapplicable. Quite good success has been attained in using an absorption spectrum. A tank with glass sides, and containing hyponitric and other absorbent fumes, has been tried. This is placed in front of the plate, so that the spectra have to pass through it. It absorbs certain known constituents, producing lines corresponding to known wave lengths, to which the natural lines of the star may be referred. It is questionable if a greater triumph in astronomy has ever been achieved than the determination of the motion of a star directly toward or away from us; and by photographic methods it is evident that a greater degree of accuracy may be introduced into the solution of this problem. The identification of the lines with those of terrestrial substances is also one of the lines of work mapped out for the future, and the grouping of stars of identical or similar spectra.

The first effort at celestial photography is stated to have been made at Harvard College observatory on July 17, 1850. Mr. T. A. Whipple, directed by Prof. W. C. Bond, exposed a daguerreotype plate in the focus of the fifteen inch equatorial, which was kept pointed upon α Lyræ. A very good image was thus obtained. The double star α Geminorum gave an elongated image, evidently due to its two components. It was found that such bright stars could be made to give faint images, but no success followed when fainter stars were the objects. Even of Polaris no image could be obtained with any exposure. The experiments were at last discontinued. Seven years later they were resumed. Collodion plates had now been introduced, which far exceeded in sensitiveness the old daguerreotype. A short exposure of eight seconds or less sufficed for a great many stars. The driving mechanism of the telescope had also been improved. Prof. Bond's account of these investigations is placed among the classics of astronomy. The work was continued by Rutherfurd and other astronomers, the work increasing in perfection as the photographic processes improved.



PROGRESS IN STAR SPECTROSCOPY.

Dr. Henry Draper began to use dry plates. On March 11, 1881, he reached a critical point. He obtained photographically the image of a star so faint as to be barely discernible by the eye through the same telescope. This marked the point where the plate compared in sensitiveness with the retina. Even at the present day it is doubtful if the dry plate can capture more stars than can be seen by the eye. Owing to difference of color, it is possible that some stars invisible through a specified telescope can be photographed through it, while others visible through the same glass may not affect the plate. Mr. A. A. Common, in his photograph of the nebula in Orion, is believed to have obtained images of stars invisible through the telescope with which they were taken.

In 1863 Dr. Huggins obtained a photographic image of the spectrum of Sirius. It was merely of interest as

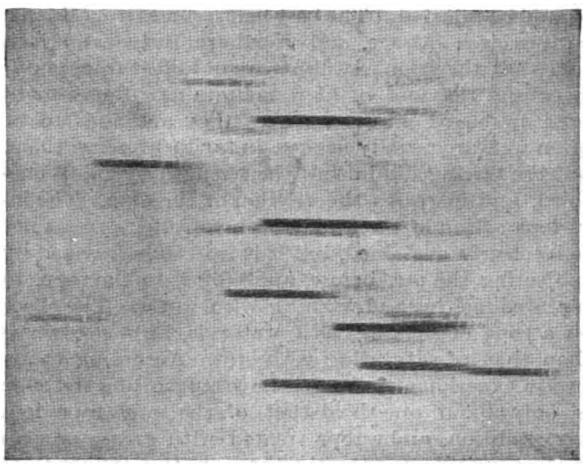
* Continued from SCIENTIFIC AMERICAN, October 15, 1887.

a curiosity, being valueless on account of its poor definition. No lines could be observed in it. In 1872 Dr. Draper made the first successful photograph of a spectrum of a star. It was of Vega, and showed four lines. He and Dr. Huggins continued the work. Their method was to concentrate the light by a telescope upon the slit of a spectroscope, the slit lying in the focus of the objective. This was a very troublesome operation, and lacked the simplicity of the present method. Progress was slow until the introduction of dry plates. The old collodion plates could only be exposed a short time because the film dried, and even then were less sensitive than the dry plate. In 1882, shortly after the era of dry plate photography, Dr. Draper died. Since that period the progress has been very great. By the use of the great battery of prisms, and the methods of trailing and enlarging that we described in a recent issue, the spectra have grown from little rectangles less than an inch in length, with barely discernible bars, to wide bands eight or nine inches long, and full of characteristic lines.

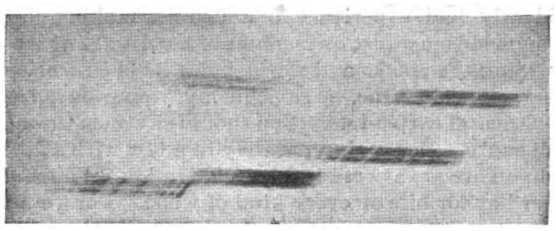
In the plate the recent progress of the science is shown. The scale is a diminished one. Fig. 1 represents the work of the year 1882. Five stars have their spectra in the little spot, the telescope having been directed upon them in succession with five minute exposures. Fig. 2 shows a modern spectrum of a bright star, with an adjacent one of a fifth magnitude star, as taken with the eight inch Voightlandef objective. Fig. 3 is the spectrum of α Lyræ taken with the eleven inch objective and fifty-nine minutes' exposure through two prisms. Fig. 4, the spectrum of β Geminorum, was taken with fifty minutes' exposure through the same instrument, and with four prisms. Fig. 5 shows the enlargements of the same spectra between the points marked *m* and *n*. This is only a little over one-half the spectrum. Below it Fig. 6 shows an enlargement of the spectrum of the same star from a less perfect photograph.

In the other plates the different phases of the work as described in the first article of this series are given. The horizontal streaks disposed of by the cylindrical lens, and the inclination of the lines of the spectra, can here be seen. Examples of the finished work are also given. By cutting out from the magnified spectra a band at a proper angle, the lines are brought into a perpendicular position.

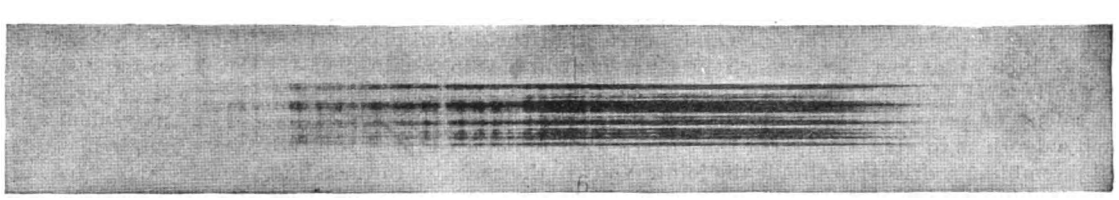
These two articles can give but an imperfect idea of the work of the Henry Draper Memorial. By the liberality of Mrs. Draper, every clerical assistance is furnished that can forward the work. A large force of computers is at work reducing the observations, and the near future will witness the promulgation of a most important body of scientific data. We cannot close without expressing our thanks to Professor E. C. Pickering and Mr. W. P. Gerrish. To the monographs of the first named gentleman and to the personal attentions and explanations of the latter, and to the use of plates and prints furnished by the observatory, we are indebted for whatever of value we have succeeded in presenting our readers.



PHOTOGRAPHIC PLATE OF STAR SPECTRA AS DEVELOPED AFTER EXPOSURE IN TELESCOPE.



STAR SPECTRA SHOWING INCLINATION OF BARS.



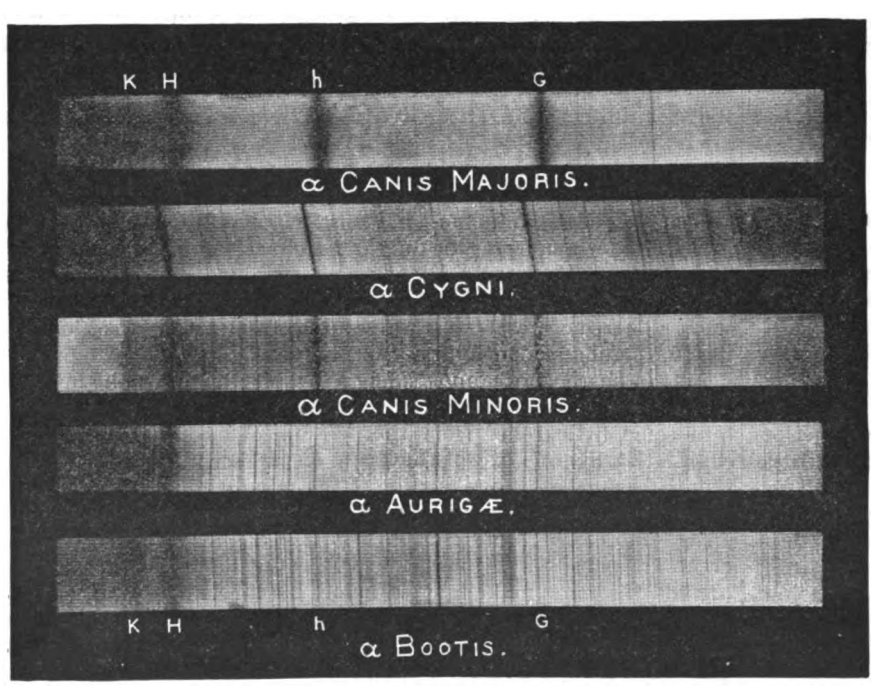
STAR SPECTRUM SHOWING HORIZONTAL STREAKS.

Fast Stenographic Writing.

It is believed that stenographers in this section, as well as those having occasion to employ them, will be interested in the result of a test as to the possible speed of stenography, which took place at the convention of the New York State Stenographers' Association, at Alexandria Bay, N. Y., August 16 and 17, at which the writer was present. The test was in consequence of an offer of a $50 gold medal to any stenographer who should write 250 words a minute for five consecutive minutes, from reading of new matter, and should read it back correctly. The offer was made by Mr. A. P. Little, of Rochester, a member of the N. Y. S. S. A., and was made by reason of statements which have appeared from time to time regarding phenomenal rates of speed attained by Western stenographers.

Mr. Little's challenge was a very sweeping one, and the prize offered, together with the renown to be gained by the person who should carry it off, was calculated to attract to the contest each stenographer who believed that he could perform the feat. In fact, during the year that the offer has been before the stenographic public, Mr. Little has received letters, for the most part from Western stenographers, deriding him, in a measure, for his disbelief in the possibility of performing the feat, and, by implication at least, claiming superiority for the Western reporters over those of the East, generally closing by stating that unless sickness or death should intervene, the writer or one of his friends would be on hand and carry off the prize. The fact that but two stenographers presented themselves as candidates for gold and laurels—viz., Mr. Fred. Irland, of Detroit, and Mr. Isaac L. Dement, of Chicago—would seem to indicate that the past year has been an unhealthy one among fast stenographers. Of Messrs. Irland and Dement only the latter made the trial, the result showing that Mr. Little knew what he was talking about. Mr. Irland read to Mr. Dement from a printed copy of notes of testimony supplied by Mr. Little; a committee, consisting of Mr. Bishop and Mr. Thornton, members of the association, and Mr. Easton, a stenographer practicing in Washington, making the selections of matter. Mr. Dement tried three times to accomplish his object, but failed, although the results indicated that he was a first-class stenographer, and that possibly he might have met with better success in a trial less calculated to upset his nerves, if, indeed, he has any, than before an assembly composed of 40 or 50 competent stenographers, three of whom held watches in their hands as a committee, the majority of the remainder keeping time and watching the lightning-like movements of his pencil for their own satisfaction. On one trial Mr. Dement wrote after a reading 1,292 words in five minutes, an average of 258 2–5 words per minute, but failed to get all of it, though the committee reported, as the writer remembers it, that he made but three minor errors and one flagrant one. The other tests were failures, one by reason of Mr. Irland making a miscalculation, and reading but 1,200 words in the five minutes, it not being known how near Mr. Dement came to writing the 1,200 words, whether he did it or not.

One of the elements upon which Mr. Little relied was the extreme difficulty of reading or speaking 1,250 words correctly in five minutes. On the whole, Mr. Little was proved to have a fairer idea of what could be done in writing shorthand than he was given credit for, while Mr. Dement proved himself to be entitled to be rated among the first-class stenographers of the country, of whom the statement has been made, and not gainsaid, that there are not more than forty in the United States. *Boston Herald.*



STAR SPECTRA

Pine-Needle Baths.

Under the name of "Fichten-Nadel-Bäder," the balsamic and tonic properties of the fir-needles are largely taken advantage of in Germany, thanks to a new preparation which enables them to be easily used for baths. These baths are now being prescribed for children and adults, and are found to be truly efficacious in rheumatic complaints, gout, certain skin affections, etc. This new preparation is in the form of a powder, which is directly used for the baths by being put into lukewarm water and allowed to digest in the liquid for a few minutes, in order that the balsamic virtues of the needle-leaves may be drawn out. The same product is likewise used for fumigations in affections of the chest, etc., or as an antiseptic, for which purpose a little of the powder is placed upon a heated iron shovel and thus carried about the apartment.

The pine-needle power is put up in packets weighing about 1 lb. (or ½ kilo.)

A bath for an adult will require ¼ to ½ kilo. of the powder. For a child's bath, 1 to 4 tablespoonfuls will be found sufficient.

Not long since, we drew attention to the turpentine vapor baths used to some extent in Paris. But this German preparation of pine-needles is simpler, cheaper, and, we should imagine, quite as effective.

The pine-needle baths are prescribed for invigorating the system generally. They act upon the skin as a balsamic stimulant and antiseptic. Thus they may prove useful as a prophylactic remedy in epidemics of various kinds, and herein lies one of their greatest recommendations.

Dr. E. Meusel, of Gotha, has used these pine-needle baths with satisfactory results in the hospital to which he is attached. Dr. G. Gruebler, of Leipzig, says that he found water at 38° C., or thereabout, soon withdrew the aromatic principles of the fir-needles' powder, and that 1 per cent of the latter is amply sufficient to give the bath all the desirable properties. The water has then a powerful aromatic odor of the pine-needle essence. Dr. Von Schwartz, an able chemist, has examined the pine-needle powder as used for these baths, and finds that it yields about 25 per cent of active extractive matter—a result which corresponds very well with determinations by other chemists.

It results from what we have just said that in this pine-needle powder now manufactured in Germany we possess a material which enables any one to procure, at a moment's notice, the fashionable *Fichten-Nadel* bath, which appears likely to come more into vogue every day. The new product has placed this luxury at our disposal at a very moderate cost. —*Monthly Magazine.*

The Machine Screw Trust.

About a year ago, an association of the manufacturers of machine screws in this country was organized. The members of the association were as follows: The Chicago Screw Co., Chicago; the Detroit Screw Works, Detroit; Western Automatic Machine Screw Co.; Rochester Machine Screw Co., Rochester, N. Y.; Hartford Machine Screw Co., Hartford, Conn.; Worcester Machine Screw Co., Worcester, Mass.; McCloud, Crane & Minter, Worcester; Reynolds & Co., New Haven, Conn.; Hopedale Machine Co., Hopedale, Mass. The purpose of this organization was to secure uniformity of action relative to price lists and discounts. The *Industrial World* says the members have had ample time and opportunity to judge of the practicability of the association, and are so well satisfied with it that at their recent meeting held in Rochester, N. Y., they passed resolutions readopting their present price lists and discounts for another year, and re-electing the officers of the association. The officers are: Geo. A. Fairchild, Chicago, president; Chas. E. Roberts, Chicago, secretary and treasurer.

The South Pole.

Sir Graham Berry, the Agent-General for Victoria, has presented to her Majesty's ministers a request that they would be pleased to aid in an Antarctic expedition. This request proceeds from Victoria, Queensland, New South Wales, South and West Australia, Tasmania, and New Zealand, which have all agreed to support the enterprise, which will probably employ some sixty to seventy thousand pounds. The English government is asked to contribute the most moderate sum of five thousand pounds—not indeed that the money is wanted so much as the recognition of the parent country is to the undertaking of her loyal children. The Australians would not experience the least difficulty in financing an undertaking tenfold the magnitude of the present proposed one. Therefore their act in coming to the parent country should be looked upon as an act of filial duty gracefully rendered, and we hope, for the credit of the empire, that it will meet with a not less graceful recognition. The British Association had this matter down in its agenda, but was detained from bringing the object forward from want of time and other circumstances—a matter that is to be regretted, inasmuch as the subject would have been well and carefully handled, and would have gone forth to the cultured reader with the stamp of genuineness upon it, thereby enforcing its claims upon the country as well as upon the government. Sir Allen Young will be asked to undertake the command of the "British Australian Antarctic Expedition," should the reply of the government be a favorable one, which doubtless it will be.

A better man, perhaps, it would be difficult to get than Sir Allen, whose knowledge of thick-ribbed ice is well known. Deputy Inspector-General R. M'Cormick, R.N., F.R.C.S., published some three years ago a very interesting work entitled "Voyages of Discovery in the Arctic and Antarctic Seas," being a personal narrative of attempts to reach the North and South Poles. Dr. M'Cormick was chief medical officer, naturalist, and geologist to the expedition the adventures of which he relates so graphically; and the narrative is by far the best reading we know upon that most interesting subject, the Antarctic regions. Wilkes, the American, took things too much for granted for his account to be relied upon of what he thought he discovered in the Antarctic circle. Apart from the enterprise, there is a prosaic side to the question, and one that may yield sterling results, for the narrator, who landed with Sir James Ross upon one of the islands, says: "The margin or ice foot upon which we at last effected a landing took us upon a nearly level surface, a guano bed in fact, formed by a colony of penguins for ages past. It had attained such a depth as to give an elastic sensation under the feet resembling a dried-up peat bog. It would afford valuable cargoes of guano for whole fleets of ships for years to come." And again he says, "As we coasted along the 'Barrier' (a wall of ice with a sheer descent of some 200 feet), we fell in with many whales, both finners (the right whale) and spermaceti . . . A very successful whale fishery might be carried on here. The whales are of the very largest size, especially the spermaceti, perhaps the most valuable of all." This was written before the days of steam whalers; and the difficulties that the Erebus and Terror had to encounter, under the command of Sir James Ross and Captain Crozier, would in a great measure have vanished. Then, with regard to the scientific side of the undertaking, our magnetic, meteorological, geological, and, though last but not least, our geographical knowledge must each and all become most valuable additions. A farther insight into the mysteries of that most mysterious active volcano, Mount Erebus, over 12,000 feet in height, is no mean factor in the matter. So is Mount Terror, in its mighty mantle of eternal snow. To achieve all this, and to add another page to our long list of daring and useful deeds with which the reign of Victoria abounds, should be incentive enough for the parent to go hand in hand with her lusty offspring in the "British Australian Antarctic Expedition."

Use of Ropes.

The *American Architect* translates from the *Bautechnische Zeitung* the following practical suggestions in regard to the use of ropes which may be worth remembering. With hemp ropes the character and probable strength may be judged in some degree from the appearance. A good hemp rope is hard, but pliant, yellowish or greenish gray in color, with a certain silvery or pearly luster. A dark or blackish color indicates that the hemp has suffered from fermentation in the process of curing, and brown spots show that the rope was spun while fibers were damp, and is consequently weak and soft in those places. Sometimes a rope is made with inferior hemp on the inside, covered with yarns of good material, but this fraud can be detected by dissecting a portion of the rope, or, in practiced hands, by its behavior in use. Other inferior ropes are made with short fibers, or with strands of unequal strength, or unevenly spun. In the first case the rope appears woolly, from the number of ends of fibers projecting, and in the latter the irregularity of manufacture can be seen by inspection. Occasionally, a hemp rope is spun with a core or central strand, such as is used in the interior of many wire ropes. This somewhat increases the strength, but the core, shut in by the outside strands, is liable to rot and infect the rest, and any rope with a musty, mouldy smell should be rejected. The best hemp comes from Russia, Switzerland, Alsace, and Northern Italy, and it is said that the strongest fibers are obtained from plants grown at the foot of high mountains. Ropes to be used on board ship, or where they are liable to be often wet, are usually soaked in tar to preserve them, but the tarring diminishes the strength by about one-third, and increases the friction of the rope. The injurious action of tar upon the hemp fibers seems not to be clearly explained, but it is said to be lessened by subjecting the tar, before applying it to the rope, to repeated melting and washing with water. The effect on a rope of soaking with water is, however, worse than that of saturating with tar. According to accurate experiments, the tensile strength of a wet rope is only about one-third that of the same rope in a dry condition, and a rope treated with grease or soap is weaker still, apparently through the influence of the lubricant in facilitating the slipping of the fibers. It should never be forgotten that hemp cords contract strongly on being wet, a dry rope twenty-five feet long shortening to twenty-four feet or less when dipped in water or exposed to heavy rain.

Restoring Old Furniture.

A correspondent in the *London Mechanic*, who has evidently had experience in a cabinet making shop, recommends sawdust or raspings of hard and soft wood for filling the cracks and worm holes in old furniture. I learned their value, he says, in my young days from the Oriental carpenters. You should sift them through wire gauze. Put each separately in a box with a label, and you are always ready for a sudden job. I have another box for bits of every kind of wood. For a crack, a worm-eaten hole, or a deep flaw, prepare the proper dust, by the admixture of brickdust in flour (also kept ready), or whiting, or ocher, or any required tint. Then take well-cooked glue, and on a house plate stir it in slowly while hot, with sufficient powder for your work. Dab the hole or crack with your glue brush, then with a putty knife stir about the mixture on the plate, taking care you have the right color. When sure on this point, take some of the cement on the end of the knife and insert it in the desired place. Then use as much pressure as you possibly can with the blade, and keep smoothing at it. Sprinkle a little of the dry powder on the spot. When thoroughly dry, sandpaper the surface with an old used piece, so as not to abrade the joint. You can then varnish the mending. Where weevil and wood worms have devoured the furniture, cautiously cut out the part till a sound place be reached. Poison the wood with a solution of sulphate of copper injected into the hollow. Let it dry, Cut an angular piece of same wood from your board, and with a sharp chisel make a suitable aperture for its reception. Fix it with glue. When thoroughly dry, work with carving tools or rasp and glass, scraping till the new bit of work exactly matches the old.

The Train Dispatcher.

How few there are who, when riding along in comfort and safety upon one of our railroad lines, ever think of the officer who is watching the progress of their train, directing its movements from station to station, and side-tracking the numerous other trains upon the road, in order to present a clear track to the one in which they are riding; and yet the lives of all the passengers are really intrusted to his vigilance and care. A moment's neglect or thoughtlessness, a moment's doze in his chair, a single glass of liquor to befuddle his brain, and sudden death in its most hideous form may be the lot of those whom it was his duty to watch and protect. There seems to be hardly any other position among all the numerous avocations of a civilized life calling for as great a degree of unrelaxing watchfulness and involving so fearful a responsibility.

Who is there who cannot safely allow his thoughts to wander for a few minutes during the day, and so obtain some little relief from the pressure of business cares? Hardly one except the train dispatcher. For him there must be no relaxation of the mind while he remains on duty. Not a minute of day dreaming; not an instant of forgetfulness. So constant a strain, so great a responsibility cannot fail to wear upon a man's life and vigor and make him old before his time.

When we consider the nature of his duties, it must be a matter of surprise that so few accidents occur which can justly be charged upon the train dispatcher. A thousand times a day does he give orders for the safety of the trains under his direction, and scarcely once in a generation does the wearied brain for an instant relax its watchfulness. These men, in whose hands our lives have been placed time and again, and who have safely carried us through all the dangers which environed us, are certainly entitled to at least the degree of thankfulness that is implied by an occasional remembrance of their existence.—*Railway Review.*

Power in the Future.

Let any one consider what the steam engine was forty years ago, and then examine the very latest improved compound engine of to-day, with all its appliances for economy and efficient service, and then let him try to estimate what the electric motor of thirty years hence will be. The compound engine, with its wonderful performance, has come as a result of long practice, large experience, profound study, and the application of a wide acquaintance with principles. Why should not the electric motor gain as much from the same sources? And, if it shall so gain, is it unreasonable to suppose that electricity may crowd out steam, in a good many cases, as a source of power? If large power can be stored in the form of electricity, so that it may be transported on a street car, why may it not be generated at one point, and then be shipped to another, like any ordinary commodity, to be used as it is wanted? Why, for example, should not the water power of Niagara be employed to generate power, which shall then be stored, transported, and sold to operate mills in Philadelphia? There is a regular market now for coal. Why should there not then be a regular market for stored power? Why should not a mill owner then go out and buy his power, for the season, just as he buys his cotton, his wool, or his dye stuffs? If power can be baled up like cotton or barreled up like sugar, then we shall have power dealers, power brokers, and, may be, a power exchange—in fact, all the details of a new and important industry. Is this a fantastic supposition? Not half so fantastic as the notion of traveling from Boston to Philadelphia in a single night was to our grandfathers. It is rather a clearly indicated possibility, the promise of which is contained in the street car which is now moving about under an impulse derived from a steam engine that stopped before the car started.—*Textile Record.*

Military Dogs.

The canine service which had been introduced by way of experiment in the maneuvers of the Ninth French Army Corps proves to have exceeded the most sanguine expectations entertained of its utility. During the separate operations of the 32d Line Regiment, the animals were placed under the control of Lieut. Jupin, with a party of four privates, and after three days' training they were fit for service. Upon vedette duty, and in company with single sentries, it was found that the keen scent and watchfulness of the "dachhunds" and poodles, which had been selected haphazard for the trial, enabled them to *give notice* by growl or importunity to their human companions of any movement or the approach of strangers within three hundred yards of their posts at night time. Sentinels were reassured by the society of the dog, and the pickets could repose in all confidence after the fatigues of the day. The communications between the main guard, or headquarters, and the posts were in the meanwhile efficiently maintained, and not a single dispatch or report intrusted to the animals for conveyance in the leathern wallet at their necks was either miscarried or delayed in transmission. The carriage of papers, especially, was performed with more celerity and greater dispatch than by horsemen, and one quality of the four-footed orderlies, not unimportant in its way, was the instinct that naturally guided them in the search and discovery of potable water when the troops, as it frequently occurred, were athirst, and needed the refreshment.

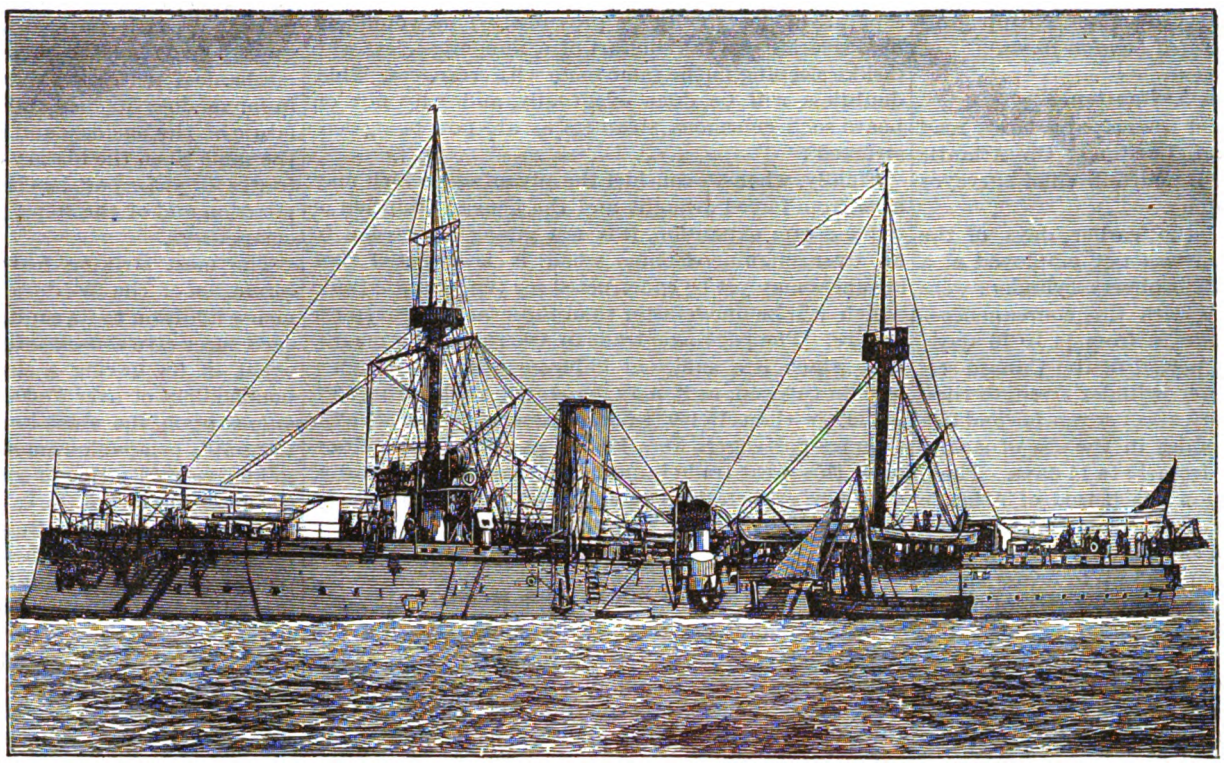
Diminution of Water Supply.

Reports from Indianapolis, Ind., are to the effect that fully ninety per cent of the "dug wells" in the city are becoming exhausted, and many which have been furnishing a supply for twenty years have had to be deepened. There are two strata of water-bearing soil under the city, separated by a layer of impervious clay, and within the past ten years the surface of the upper stratum, from which nearly all the wells are supplied, has gradually gone down, until now it is at least five feet lower than a decade ago. In time it will become exhausted and the supply will have to be drawn from the lower stratum, which is practically inexhaustible. According to a statement in *Fire and Water*, the benevolent institutions and the larger factories are already drawing from this supply, and the water is purer than that which is obtained from the upper level. This diminution of the water supply is attributed to the clearing away of the forests and the tilling of land, these two causes increasing the evaporation and carrying away the rainfall quickly to the streams, instead of allowing it to gather in underground reservoirs and watercourses.

NEAR Nashua, N. H., recently a muskrat, in digging a hole in the bank of the canal, caused a leak and, eventually, a disastrous flood. The water swept through the woods, carrying trees and everything else movable with it into the Nashua River. The mills at once shut down, and 3,000 persons will be kept out of employment for an indefinite time. *Fire and Water* is our authority for saying that it will take three weeks to repair the damages caused by that one muskrat.

THE NEW CHINESE NAVAL SQUADRON.

A squadron of five new vessels of war constructed by British and German shipbuilders for the Chinese navy, and commanded by Admiral Lang, an officer of the royal navy holding the rank of captain in her Majesty's service, recently left Spithead for China. It consists of two swift "protected cruisers," the Chih Yuan and the Ching Yuan, built at Elswick, Newcastle-on-Tyne, from designs by Mr. W. H. White, of the firm of Sir William Armstrong, Mitchell & Co.; two armored cruisers, the King Yuan and the Lai Yuan, built at Stettin, on the Baltic, by the Vulcan Shipbuilding Company; and one torpedo boat, built by Messrs. Yarrow & Sons, of Poplar, under a contract with Messrs. John Birch & Co., of Liverpool.

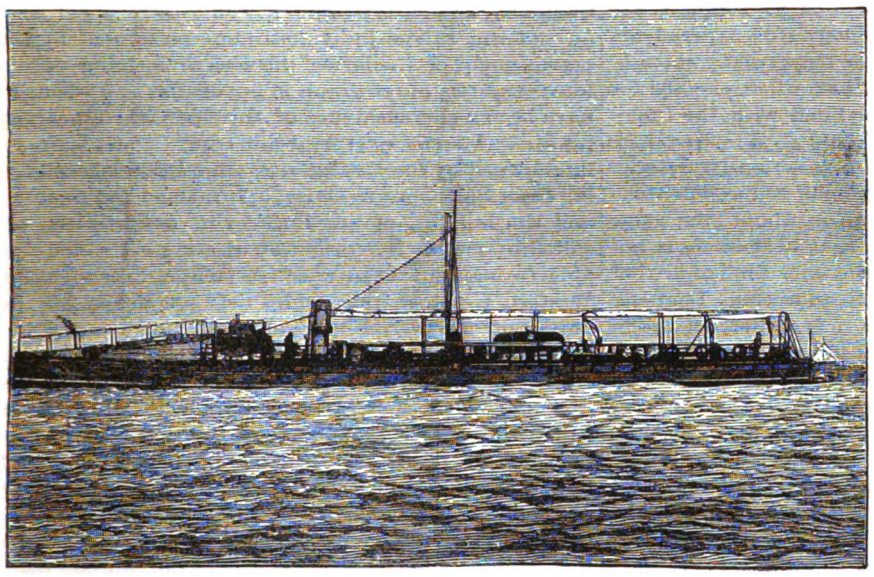


THE CHIH YUAN.

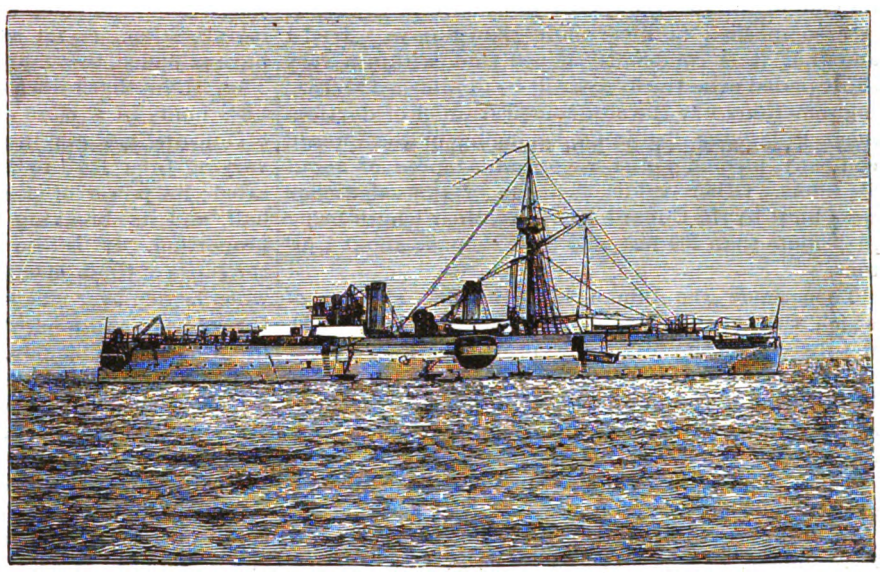
The Chih Yuan and the Ching Yuan have been constructed under the superintendence of Liu Ta jen, the present Chinese minister. Their displacement is 2,300 tons, the length is 268 feet, breadth 39 feet, and depth from the main deck to the keel moulded 21 feet. The draught forward is 14 feet, and aft 16 feet. Each vessel has two pairs of triple expansion engines, constructed by the firm of Messrs. Humphrys, Tennant & Co. Both the engine and boiler rooms are divided into water tight compartments by transverse and longitudinal bulkheads, and the machinery is so arranged that either boiler can work on either engine or on both, and the change can be carried out while the vessel is in motion. On the four trial trips, two with and two against the tide, with all their weights, armament, and Chinese crews on board, they attained an average speed of 18·536 knots. The material of each vessel is steel. There are two decks, the lower one being of the turtle back form, consisting of 4 in. steel plates rising in the middle above the water line, and inclined at the sides so as to dip some feet below it. The engines, magazines, rudder head, steering gear, and all the important parts of the vessel are protected by this deck. The openings in the deck are encircled by cofferdams, protected by steel plates, inclined so as to deflect the shot. The bows are formed and strengthened for ramming purposes. On the turtle deck, running parallel to the sides of the vessel, is a partition, inclosing a space between itself and the side. This space is subdivided into a great number of water tight compartments for the reception of coal or patent fuel. An additional protection of a layer of coal, about 8 ft. in thickness all round, is thus given to the vessels. The bunker accommodation is 450 tons. Both ships have double bottoms.

The armament consists of three 21 centimeter Krupp guns, two 6 inch Armstrongs, eight 6 pounder rapid firing Hotchkiss guns, and six Gatlings. Of the Krupps, two, which are placed in the bows, are mounted on Vavasseur carriages, on revolving platforms, protected by splinter proof shields, and one, which is in the stern, is also placed on a Vavasseur carriage revolving on a center pivot. In both cases the guns are moved by means of hydraulic machinery. The Armstrongs likewise move on center pivot Vavasseur carriages, and are placed on sponsons at the side of the vessel, so as to allow of the training of the guns over a very large arc, about 160°. These likewise are protected by 2 inch steel plate splinter proof shields. The torpedo armament consists of four above-water torpedo guns, one, fixed in the bow, firing right ahead, one right astern, and two training guns are fixed in each broadside forward. There are two electric search lights for each vessel, of a nominal power of 25,000 candles. Each has a conning tower of 3 in. steel plates, from which the working of the ships, guns, and torpedoes can be directed. An important addition is an armor plated tower, for the protection of the signalman, which was suggested by Admiral Lang. The guns are provided with converging fire apparatus, so that they can be fired singly or simultaneously.

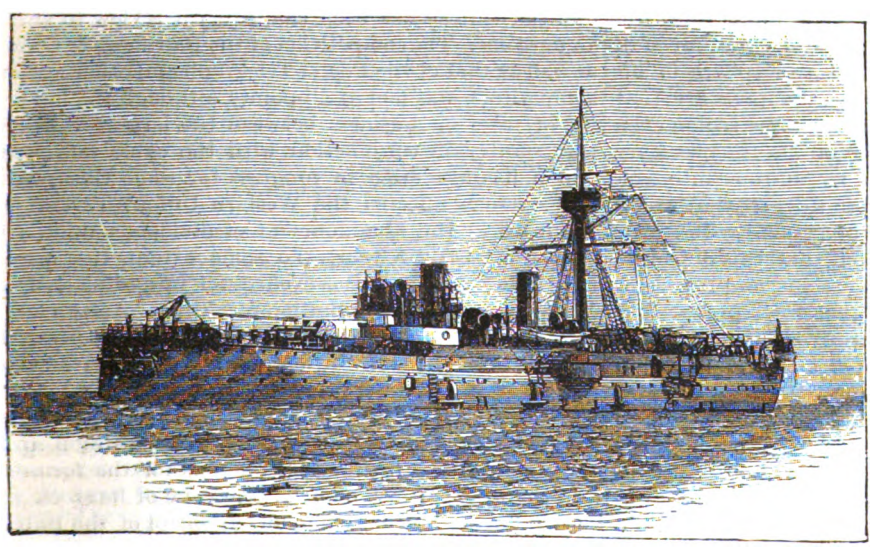
The torpedo boat, built by Messrs. Yarrow, is said to be the fastest of its size that has ever been launched. It has reached the great speed of about twenty-eight



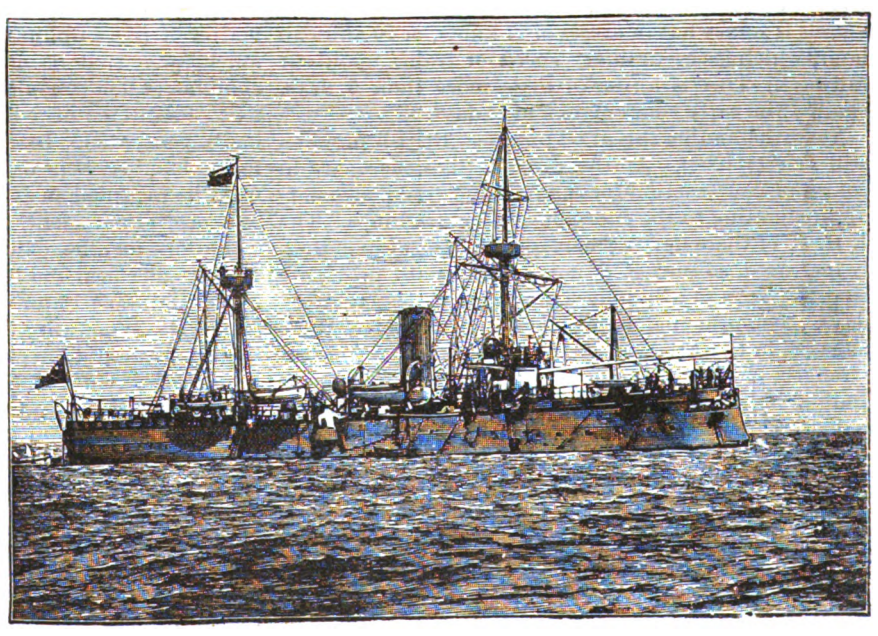
THE YARROW TORPEDO BOAT.



THE KING YUAN.



THE LAI YUAN.



THE CHING YUAN.

SQUADRON OF NEW CHINESE WAR VESSELS.

miles an hour. It is armed with two fixed 14 in. torpedo guns in the bows and one 14 in. training gun on deck abaft the funnel. It is also supplied with a powerful armament of Hotchkiss and Gatling guns and a strong electric search light.

The two vessels built in Germany are of the class of armored cruisers. Their speed is under sixteen knots. They are armed with two 21 centimeter Krupp guns and two small guns.—*Illustrated London News.*

Atlantic Steam Navigation.

The following is an abstract from a paper lately read at the American Exhibition, London, "On Atlantic Steam Navigation," by Mr. B. Martell, chief surveyor of Lloyd's Register of Shipping.

As regards cylinders, in the earlier days of the Cunard service, when steam was not employed at a higher pressure than two atmospheres, cylinders were cast at five to six tons tensile, with this consequence—that Sandy Hook was made in from 14 to 16 days. Later on, say in the Scotia period of the Cunard service, there was still no greater cylinder strength than five to six tons tensile, nor any use of steam beyond two atmospheres. But by economies in the use of steam, Sandy Hook was made in from 12 to 14 days. Then, all of a sudden, we come upon the period of Atlantic racers, the cylinders of the Umbria and Etruria, and other ships, being cast from the foundry cupola up to fifteen tons tensile, and steam used up to nearly six atmospheres, on the average of the cylinders of triple expansion, with Sandy Hook made in say six days. Then there is a Glasgow secret process, which has been in operation for twenty-five years, which recently cast the torpedoes for harbor defense, which has cast propellers for the Dundee whalers for fourteen years, and which has been largely intrusted with the castings for British lighthouses. That system makes castings, of all sections, from the foundry cupola up to twenty-eight tons tensile. Query: What would be the Sandy Hook time with twenty-eight tons tensile cylinders?

It was not until the paddle steamers Sirius and Great Western had crossed the Atlantic, the former in 15 days and the latter in 17 days, that the marine engineer had a chance. Since 1838, steady progress has been made in the steam propulsion of vessels, and now, instead of 15 to 17 days to perform the voyage, it is accomplished in little more than 6 days. Need I add that it is confidently hoped that within a very short period even the 6 days will be diminished? Taking something like the chronological order of development, in 1840 the Britannia, belonging to the Cunard company, made her first voyage at a speed of about 8½ knots. Other paddle steamers of the same class were built by the Cunard company, their length being little more than 200 feet, and their tonnage about 1,100 tons.

Then came the Inman line, the first steamer of which, the City of Glasgow, with a tonnage of 1,600, was fitted with the first screw propeller which crossed the Atlantic. That was as recently as 1850. In 1874 the White Star line gave the greatest impetus to transatlantic navigation, Messrs. Harland & Wolff launching the Britannic and the Germanic. These vessels were far in advance of all their predecessors, and were of the following dimensions:

Length, 455 ft.; breadth, 45 ft. 2 in.; depth, 33 ft. 7 in.; tonnage, gross, 5,004; and 760 H. P.

The average time occupied by these vessels was a little over 8 days, and it was not until the construction of the Arizona, five years later, that the time was sensibly diminished. Since then a strong feeling of competition has prevailed among the companies, resulting, as a commencement, in the construction of the sister ships the Umbria and Etruria by Messrs. John Elder & Co. The length of each of those ships is 501 ft. 6 in.; breadth, 57 ft. 2 in.; depth, 38 ft. 2 in.; tonnage, gross, 7,718. The greatest speed attained by either of those vessels is somewhat in excess of 17 knots, or 20 miles an hour, which is the ordinary speed of trains upon our railways. This is a time of little more than 6 days, against the early times of 15 and 17 days.

Notwithstanding this great progress, British progress still asserts itself. At the present time there are in course of construction for the Atlantic trade, steamers approximating to the enormous size of 9,000 tons. The I. H. P. of these newer steamers will be correspondingly increased, so that it is not too much to anticipate that the voyage will be accomplished in less than six days. The principal requirements for steamers to be engaged in the Atlantic service appear to be: (1) great strength, (2) speed, (3) safety by transverse and longitudinal bulkheads, and (4) comfort. For strength, the naval architect can now provide against all possible strains, even in the worst weather of the Atlantic. For speed, this can now be pretty nearly calculated, particularly where economy of space and consumption of fuel are of minor importance. The new steamers in course of construction will be fitted with triple expansion engines, and will be run with much fuel economy. For safety, there is the provision of watertight bulkheads in such number that the filling of one—or even two—will not destroy flotation. The practical difficulty hitherto has been the large space required for the engines and boilers, but by transverse bulkheads with the engines and boiler rooms placed longitudinally the difficulty is overcome. Facility is also afforded by the adoption of twin screws. As regards the comfort provided on board the recently constructed Atlantic steamers, it is lavish. At the same time, it is deserving of consideration whether the time has not come when separate cabins should be provided. This would add immeasurably to the comfort of a numerous class who dislike sleeping in the same room with strangers. This, doubtless, will be done eventually, and why not on board such enormous steamers as are now being constructed?

Finally, when we consider the advantages which may arise from forced draught and the general adoption of triple steam expansion, it is not giving expression to an over-sanguine feeling when it is asserted that steamers may yet be constructed for the Atlantic trade which will be much faster than those at present in existence. The passenger trade to America is of a magnitude which is a sufficient inducement to the designer to gain this end, as it may be stated that during 1885 no fewer than 15,160 saloon passengers and 281,270 steerage passengers were landed at New York. Moreover, this great trade is on the increase, and, naturally, with new expectations of speed and personal privacy as the highest form of personal comfort.

The Effects of Gas upon Books.

The communication of Mr. C. J. Woodward to the Association of Librarians, upon the effect of gas on the bindings of books, is an important contribution toward the settlement of a question that has for a long time vaguely vexed the minds of gas engineers and others. Gas has often been accused of rotting the bindings of books exposed to its heat and fumes on the upper shelves of libraries; but the impeachment has as often been repelled. As Mr. Woodward states, direct experimental evidence upon the point has not been obtained, although the pages of the *Journal* contain many observations on the subject. Now, however, thanks to Mr. Woodward's appointment upon the Birmingham Library Committee, we have something like definite information, though it is admitted that a good deal remains to be done to complete the investigation. So far as Mr. Woodward's experiments have extended, they appear to be trustworthy enough. They show that brown calf leather when exposed for 1,000 hours in a close chamber filled with the fumes of burning gas, and kept by these at a temperature varying from 130° to 162° Fah., is seriously deteriorated; its power of stretching being reduced by one-half, and its breaking strength in about the same proportion. It is also shown that heat alone is not the cause of these effects; for the same kind of leather when heated over steam pipes to an average temperature of 196° Fah., for 1,000 hours only, suffered a diminution of stretching power from 13 to 9 per cent, while its breaking strength was reduced in the ratio of 36 to 23. Even when kept at an average temperature of 142° Fah., or about the same heat as the atmosphere of the close gas chamber, leather does not, according to Mr. Woodward, sustain any appreciable injury so long as the air is tolerably pure. All this is very strong against the use of open gas flames in close apartments containing books bound in calf leather. It is almost too strong. Nor does Mr. Woodward leave it in doubt as to the cause of the deterioration of the leather under the influence of the products of combustion of coal gas. It is nothing more or less than our old enemy sulphuric acid, round the hypothetical presence of which in the atmosphere of gas-lit rooms so much controversy has raged. Now, it is with no desire to find fault with Mr. Woodward's method of experiment that we take the opportunity for pointing out that he has left a distinct opening for objection with regard to this matter of free sulphuric acid. It may be urged, with much force, that he made sulphuric acid in his fume chamber when it could not be made under the ordinary conditions of a library lighted by gas, even if badly ventilated. In the confined atmosphere of his fume chamber, kept as it was at a temperature that must be regarded as extreme for the upper region even of a gas-lit apartment, did he not obtain the necessary conditions for the oxidation of sulphurous into sulphuric acid—heat and moisture—in a degree that would be unattainable in an ordinary apartment? It is only fair to Mr. Woodward to point out that this objection has been raised upon previous occasions, and has never been clearly removed. We are, therefore, prepared to admit that Mr. Woodward has proved his case, so far as his conditions can be accepted as generally applicable; but this latter qualification practically reserves the whole question in its actual bearing. Hence, while agreeing that gas in libraries should for choice be burnt in some one or other of the new order of ventilating lamps, of the existence of which the associated librarians seem to require to be reminded, we refuse to accept Mr. Woodward's unventilated gas stove as faithfully representing the conditions of a library lighted by means of exposed gas flames.—*Jour. of Gas Lighting.*

The Telegraph Situation.

The absorption of the system of telegraph which had been erected under the auspices and control of the Baltimore & Ohio Railroad Company by the Western Union Company closes another of the attempts which have been made from time to time to maintain a successful and permanent opposition to the latter organization. In no country of the civilized world has telegraphy made greater strides in point of scientific and mechanical perfection than in the United States, and in none does its use enter more intimately into the fabric of the business and social life of the people. At the same time, the history of telegraphy in the United States for years past has been that of this gigantic corporation and of the steps by which it has absorbed its competitors.

The most striking feature in connection with the formation of the Western Union Company is the immense addition to its capitalization which has followed each successive consolidation, resulting before this last event in its having a share capital of $80,000,000, a bonded debt of over $7,000,000, and outstanding guarantees upon the stock and bonds of other cable and telegraph companies amounting to say $25,000,000, or in all a capitalization of some $115,000,000. Apart from the notorious fact of the extent to which what is known as water entered into these additions to its capital, it may well be doubted whether the company's existing plant represents anything like such a valuation. Forming, as it does, according to the last report, a system of 156,000 miles of poles, with 525,000 miles of wires, 15,000 offices, transmitting over 47,000,000 messages in a year, and having gross receipts of $17,000,000, it constitutes a concern of the greatest magnitude; and reaching, as it does, almost every railroad station or hamlet in the country, as well as all the important centers of population, its influence is more widespread than any other corporation in the country.

The Baltimore & Ohio telegraph system was an outgrowth of that aggressive spirit which characterized the management of the railroad company under the Garretts—father and son—and which, carried to extremes, has resulted in the present situation of that property. Declining as a settled principle to turn over the telegraph lines of the road to the Western Union Company, and entertaining, it would seem, a personal antagonism to the individual most prominent in the management of the latter, the idea of forming an extensive system of telegraph in opposition to it seems to have been a cherished idea of the elder Garrett which his son and successor carried into effect. The telegraph lines owned by the Baltimore & Ohio Railroad, extending from Baltimore to Chicago, furnished the nucleus, and the building of new lines to important cities resulted by 1885 in the formation of a system which was able to inaugurate an effective competition with the Western Union in telegraphy between nearly all the important Northern centers of population.

At the present time, the Baltimore & Ohio wires extend from Portland, Me., in the North to South Carolina, and reach their extreme limit in St. Paul in the Northwest and Texas points in the Southwest. Approximately, it owns or controls about 7,500 miles of lines, including some 55,000 miles of wires and about 1,100 offices. Exact reports of the telegraph organization's operations have never been published, and while the indebtedness of the telegraph to the railroad company is stated at about $3,875,000, reports indicate that the entire advances made by the railroad amount to perhaps $7,000,000, though this is possibly exaggerated. Similarly little is known of the results of its operations. The statement has been made that even at the low competitive rates it was self-sustaining, but this is open to some question, and there is little doubt that the continued necessity of extension and the consequent further advances it involved formed a serious element among the burdens under which the Baltimore & Ohio Railroad property labored.

The policy of the Western Union Company throughout the contest has been shaped with a view to such an outcome. The competition of the Baltimore & Ohio, as well as that of the Postal Telegraph and other minor competitors, was met at all points, although the lowering of rates on business between the largest cities of the country, in conjunction with the cable rate war which has also been in progress for some time past, has seriously affected the Western Union's revenues, resulting in the abandonment of dividends upon its stock for nearly a year. To some extent, therefore, this policy may have been effectual in adding to the embarrassments of the Baltimore & Ohio. And so well was its object understood that, from the time it became known that Mr. Garrett was ready to dispose of the control of the railroad property, little doubt existed in any quarter as to the ultimate disposition of the telegraph. The bargain between the Western Union and the syndicate is not unduly onerous for the former, and the agreed price, namely, $5,000,000 of its stock in return for the railroad company's control of the Baltimore & Ohio Telegraph organization, though a tangible increase of the Western Union's share capital, is no such addition of water as has been witnessed in former consolidations.—*Bradstreet's.*

ENGINEERING INVENTIONS.

A furnace front for boilers has been patented by Mr. James C. Shuler, of St. Joseph, Mich. The invention consists of a hollow furnace front supporting the front end of the boiler, and connected with its interior by pipes or other suitable means, to prevent waste of heat and serve as a feed water heater.

A car coupling has been patented by Mr. William H. Tibbits, of Crab Orchard, Neb. One end of the coupling link is made thicker than the other, in step shape, with a lateral as well as vertical opening, and in the rear of the main coupling devices are other coupling devices which may be brought into play on a fracture or other mutilation of the main coupling devices.

A method of blasting earth has been patented by Mr. Henry H. Bourne, of Manhattan, Kansas. This invention covers an improvement on a former patented invention of the same inventor, the the hole being first bored and a small cartridge exploded therein, when a tube is inserted with a waterproof pouch, which can be filled with a larger amount of explosive in the pocket before formed to make the blasting more effective.

AGRICULTURAL INVENTIONS.

A planter has been patented by Mr. Theodore W. Hill, of Smithland, La. Combined with the seed drum or receptacle is a curved cut-off connected to a shaft upon the carrying frame, to prevent the accumulation of the seed at the depositing chutes, with other novel features, the device being especially adapted for depositing in the ground cotton seed, corn and pease.

A transplanter for tobacco and other plants has been patented by Mr. Daniel Clow, of Janesville, Wis. It consists of a wheel with radial pockets to receive the plants, with clamp devices to hold them while moving down to the ground, and other novel features, whereby the plant is placed, earth packed around it, and a quantity of water delivered upon it, in a single operation.

A hay cocking machine has been patented by Messrs. Thomas and Henry Hale and Sylvenous D. Harvey, of Wales, N. Y. It is a simple and comparatively inexpensive machine, to be operated by a single attendant driving the horses, for quickly gathering and cocking hay or other fodder and discharging it on the ground in compact piles for protection against storms.

A combined plow, harrow, and cultivator has been patented by Mr. Franklin P. Sanborn, of Standish, Me. The invention covers novel features of construction and the combination of parts, whereby with one machine, and the attachments forming parts of it, the soil may be broken and harrowed, and also cultivated, at various stages of growth of a large variety of crops, with thoroughness and economy of time and labor.

MISCELLANEOUS INVENTIONS.

A textile eyelet for corsets has been patented by Mr. Edward K. Warren, of Three Oaks, Mich. The eyelets are made of tape, doubled or bent to form eyes for the passage of the lacing cord or string through them, with novel means for supporting and securing the eyelets to the garment, making a firm and substantial eyelet.

A barrel stand has been patented by Mr. Stewart R. Mace, of Moulton, Iowa. This invention provides a swinging or hanging support for barrels, with means for retaining barrels or kegs in position, and for elevating and handling them, whereby liquids may be drawn from them with dispatch and convenience.

A horseshoe has been patented by Mr. Samuel B. Jerome, of New York City. It has several calks struck out of the web of the shoe within the area of its width, forming corresponding pockets in the upper surface of the shoe to receive ointment for medicating the hoof, and also making a shoe which is light and cheap.

A paper ruler has been patented by Mr. George M. Rees, of Brooklyn, N. Y. It consists of two ruling bars running parallel and secured together at their ends, to facilitate the ruling of the bottom edges of pages of a book without turning the book upside down, and prevent blotting of ink on the page when ruling.

A motor for pumps has been patented by Mr. William W. Ward, of Eaton, Ohio. This invention covers a simple description of clockwork gearing whereby a pump rod is operated by the falling of a weight by gravity, thus unwinding the rope on a drum to which is attached a prime motor gear wheel, the machine being quite inexpensive to make or set up.

A salve has been patented by Mr. Philip L. J. Schaefer, of Kansas City, Mo. It is composed of ingredients which undergo a chemical process in compounding to evaporate injurious properties and make a salve which will not heal a sore until all poisonous matter has been discharged, and also efficacious as a plaster, and in all forms of inflammation, burns, etc.

A jug handle has been patented by Messrs. Charles H. Wooldridge and James M. Hendron, of Shipman, Ill. It consists of a wire frame to attach to pottery jugs and similar articles, the wire surrounding the body of the vessel in such manner as to give support to a bail or handle, and permit of readily carrying the jug in a vertical position.

A shoe upper blank has been patented by Mr. John L. Skinner, of Waxahachie, Texas. It is for making an entire upper of a "plow" shoe or similar style of a single piece, having the fly folded over the instep and secured upon the side of the shoe by means of a tongue and buckle, the pattern requiring but little stitching.

A soldering iron heater has been patented by Mr. William Mellor, of New York City. It is an improved furnace, easily adaptable for melting solder or for heating soldering irons, being free from danger and simple and convenient, the invention covering various novel details in the construction, combination, and arrangement of parts.

A furnace for hothouses, etc., has been patented by Mr. William A. White, of Staatsburg, N. Y. It has a fireplace of sufficient capacity to heat a series of separate compartments for separately or collectively conveying the heat as required to different elevations, the compartments having independent draught flues, but so they can be used with the same fire.

An inking apparatus for printing machines has been patented by Mr. James J. Hughes, of New York City. By this invention one or more reciprocating transfer rollers are employed, to transfer continuously the oversupply of ink from the first set of distributing form rollers to the second or third set, whereby each set of rollers is made to give off an equal and uniform supply of ink to the form.

A seine hauling apparatus has been patented by Mr. William H. Gordon, of Brambleton, Va. The seine is connected at one end with a shore anchor, a cable being also connected with the seine, and there being an offshore guide for supporting or guiding the cable, whereby the seine may be both cast and hauled from the shore, and its management in stormy weather is facilitated.

A pedal zither has been patented by Mr. Ferdinand Wigand, of Brooklyn, N. Y. It has an additional key board with four or more frets for the pedal strings, with buttons covered with felt, one button above each pedal string near each fret, and attached to a rod connected with the pedals, whereby a performer is enabled to produce harmonious sounds in chords of all characters.

A reel holder for fishing rods has been patented by Mr. Joseph Brower, of Lexington, Ky. It consists in a novel seat for the reel, in connection with certain sliding bands for securing and liberating the reel when required, being more particularly designed for use on Japanese or bamboo rods, in which there are knots or protuberances that restrict the sliding of a circular reel-holding thimble over them.

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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.

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Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) J. H. M. asks for some standard work or works treating of the methods of artificially coloring metals, bronzes, etc., and of alloying metals to give different colors. A. Galvanoplastic Manipulations, by W. H. Wahl, is an excellent illustrated book, of 650 pages, which we send for $7.50.

(2) S. W. asks how to make a gold varnish that will be bright after it is used and will stay so without getting tarnished. A. A gold varnish to be used for iron is made as follows: Boil in an earthenware pot 90 parts or more of linseed oil, 60 parts of tartar, 60 parts of hard boiled yelk of egg, 15 parts of aloes, ¼ part of saffron, and one-tenth part of turmeric, and apply the fluid to the iron. Or else cover the gold leaf with a colorless lacquer, such as may be made by taking 1 gallon of methylic alcohol, 10 ounces of seed lac bruised, and ½ ounce of red sanders; dissolve and strain.

(3) R. B. O. asks: 1. What is good to clean a saddle made of the best light-colored hogskin so it will look like new or nearly so, without injury to the skin? A. It is not possible to restore the leather unless the discoloration is of a character that can be removed by carefully rubbing with bread crumbs or some similar treatment. 2. How may brass (such as the wheels in the works of a watch) be tempered? A. Only by mechanical compression, which is impracticable without distorting its shape.

(4) C. McC.—A round pipe has less friction in proportion to its area. The air current in a tube is rolling from the center toward the surface, caused by the friction of the tube. The air moves fastest at the center.

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Proposals must be made in duplicate and enclosed in envelopes marked "Proposals for Overhead Travelling Cranes complete, for Iron Supports for such Cranes, and Iron Frame for a Building," and addressed to the Secretary of the Navy, Navy Department, Washington, D. C.
The Secretary of the Navy reserves the right to reject any or all bids, as, in his judgment, the interests of the Government may require.
WILLIAM C. WHITNEY,
Secretary of the Navy.
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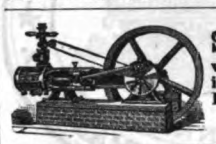

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