

Mineral Oil and Electricity for Lighthouses.

The annual report of the Lighthouse Board says that the substitution of mineral oil as an illuminant has been made in many of the fourth, fifth, and sixth order lights. All of these orders of lights would have been supplied except for the fact that it is found that the oil deteriorated when placed in the ordinary large oil butts in use, and many small cans have had to be made, into which the supply of each station is placed. The great superiority of mineral oil as an illuminant over all other oils has induced the board to try the experiment of using it in the lightships. The oil used for this purpose is 300° of the flash test. It is thought that such oil, used in the Funck lamp, will much increase the usefulness of the lightships, and a great saving in the cost of oil will be made.

The board is desirous of making experiments to test the relative merits of the electric light and other illuminants. These experiments must be made in some lighthouse and on a sufficient scale to exhaust the subject. There are many machines for generating electricity, several of them of American invention, and the board wishes to test the principal ones. An appropriation of \$50,000 is asked for the purpose of making these experiments.

An appropriation of \$50,000 is asked for the construction of a first-class lightship, fitted with a powerful steam fog signal, to take the place of the lightship now off Sandy Hook, entrance to New York harbor. This is regarded as one of the most important light stations on our coast; and as an immense commerce flows past it, it should be marked by a vessel having all the modern improvements, to make it a more certain guide to the mariner. Should an appropriation be granted, the present lightship could be moved to a less important station.

The Earth's Day Increasing.

In a recent lecture on "Eclipse Problems," Professor Charles A. Young, of Princeton, said, with reference to the observed increase in the rapidity of the moon's motion, that the discovery led at first to the opinion that the moon's orbit was growing shorter, and that ultimately the moon would come down upon us. More accurate calculation, however, shows that there is no danger of so disastrous a result. The moon is not coming nearer, but our day is growing longer, owing to the friction of the tides upon the earth's surface. The tides act like a brake, and slowly diminish the speed of the earth's rotation.

THE DUPLEX AIR COMPRESSOR.

Although compressed air cannot, under ordinary circumstances, compete with steam as a motive power, the machinery necessary to its use has been perfected to such a degree that it has been extensively applied to mining, quarrying, and engineering purposes, and it seems to be the only available motive agent for such uses. Compressed air as a motive power has been the subject of a great deal of practical investigation and experiment, and the losses arising from increase of temperature by the compression of the air and the cooling by expansion, also losses due to the resistance of the valves, and dead spaces at the ends of the compression cylinders, have all been reduced, if not avoided altogether.

The annexed engraving represents the duplex air compressor manufactured by the National Drill and Compressor Company, of 76 and 78 Center street, New York city. This machine, though quite plain in appearance, is of unusual strength and efficiency. We are informed that the performance of this engine is fully equal to that of the best engines in market. The dimensions of the compressor are as follows: Length of bed, 12 feet 6 inches; height of center of cylinders from floor, 18 inches; diameter of steam and air cylinders, 10 inches; stroke of pistons, 18 inches; length of connecting rod, 52 inches; diameter of wheel, 5 feet 6 inches; number of revolutions per minute, 133; cubic feet of free air compressed per minute, 436; weight of machine, 11,400 lb.

Steam is admitted to the steam cylinders by a slide valve having an automatic cut-off. The air cylinders are lined with composition, and kept cool by water which passes spirally around the cylinder from the center toward the ends. By this arrangement the air cylinder is kept cool without having water in the cylinder. The air piston is adjustable, and travels to within one thirty-second of an inch of the cylinder heads. The induction and eduction valves are made so that they can be removed without disturbing other parts of the machine.

The National Drill and Compressor Company build single and duplex compressors of different sizes, which may be run by direct connection with steam engines, as in the engraving, and others which may be run by belts or gearing from the shafts of water wheels or other motors; they also make a variety of rock drills and mining machines which are in use and well known in all parts of this country, and are widely and favorably known in foreign countries.

A NEW TELEPHONE.

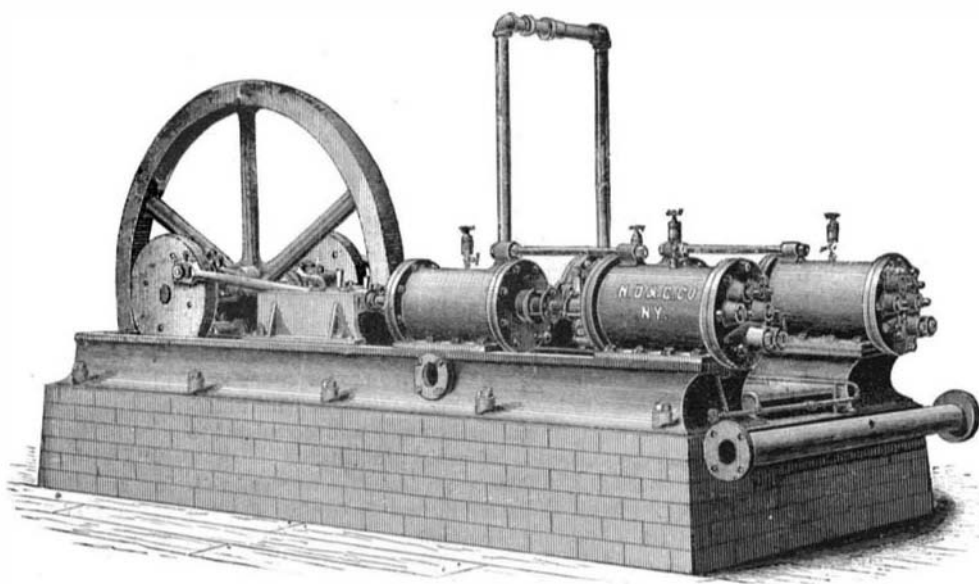
In the telephone shown in the annexed engraving the inventor has made use of Jamin laminated U-magnets to secure great magnetic power with little weight. The ends of the magnet are cut off diagonally, and the poles are each surrounded with a helix of fine insulated copper wire connected as in an electro-magnet. Two of these magnets are attached to an elliptical hoop, which surrounds the head and supports

**NOVEL TELEPHONE.**

the diaphragms and ear pieces. Each diaphragm carries a light triangular armature, which fits the poles of the magnets and nearly touches them. The telephones are connected with each other and with the line. The operation is similar to the Bell telephone. The instrument shown in the engraving is arranged as a receiver to be used with any of the ordinary transmitters, but it may be arranged as a transmitter.

Mr. Andrew C. Hubbard, of Danbury, Conn., is the inventor of this telephone.

A NOVEL system of insurance for girls has existed for several generations among the Danish nobility of Copenhagen. A nobleman, upon the birth of a daughter, enrolls her name with the insurance society, paying at the time a fee, and subsequently an annual sum, until she reaches twenty-one. She then becomes entitled to a fixed income from the society, and to apartments in the large building of the asso-

**DUPLEX AIR COMPRESSOR.**

ciation, which is surrounded by gardens and a park. Should her father die in her childhood, she may immediately occupy the apartments. Should she die or marry, the income and the right to entail the home both lapse.

MEN of science, students, inventors, and every other class of persons desirous of keeping up with the times should become regular subscribers to this paper. They will find it a paying investment, for the SCIENTIFIC AMERICAN not only contains a record of all the important discoveries and inventions of this country, Great Britain, and other English speaking countries, but translations from the French, German, and other foreign scientific and industrial publications.

MISCELLANEOUS INVENTIONS.

Mr. Judson S. Corbin, of Clinton, Iowa, has patented an improved gate, which is so constructed that it may be opened and closed by the wheels of passing carriages. It is simple, convenient, reliable, and not liable to be obstructed or get out of order.

An improved water closet cistern has been patented by Mr. Hugh Houston, of Pittsburg, Pa. The object of this invention is to provide an improvement in that class of automatic overflow cisterns for water closets, whose discharge is so regulated, by means of an overflow compartment or chamber and float and valve connected therewith, that the discharge occurs at regular intervals, and each time gives the water closet bowl a sudden flush and thoroughly washes it out.

An improvement in letter boxes has been patented by Messrs. Wauhope Lynn, of New York, and Gottfried Clasen, of Brooklyn, N. Y. It consists in providing the box with a tube extending from the slit at the top inward and downward, and closing the lower end with spring doors having arms in position to be operated upon by a plunger connected with the hinged door covering the slit at the top on the outside, whereby, when the outer door is opened to put a letter in the box, the doors at the end of the tube are closed, thus cutting off communication through the tube with the interior of the box; but when the letter is slipped through the slit and the outer door allowed to close, the inner doors open and permit the letter to fall within the box.

Mr. Theodore L. Wiswell, of Olathe, Kan., has patented a combined buckle and trace carrier, consisting of a metal skeleton buckle frame having hooks located opposite each other, and having their ends bent inward, then forward and downward, to adapt them for holding the cockeyes of the traces securely when the latter are not in use, and yet permitting convenient detachment of the cockeyes when required.

An improvement in grooving irons has been patented by Mr. John W. Ammons, of Columbia, Mo. The object of this invention is to provide a plane iron which will chamfer off the outer corners of the groove simultaneously with the planing of the groove. It consists in a plate with beveled cutting edges combined with a grooving iron.

An improved swinging gate that is to be placed across a railroad track to keep cattle and other animals off, has been patented by Messrs. David A. Walker and John R. Smith, of Fort Benton, Montana Ter. It is to be opened by the contact of the pilot or cow catcher of the locomotive, and will close automatically immediately after the passage of the train.

An improved combination tool, patented by Mr. Morgan H. Sly, of Shepardsville, Mich., combines several tools in one for the convenience of the mechanic, farmer, house-keeper, and others. It consists of a screwdriver, nail puller, wrench, nail hammer, wire cutter, riveting hammer, and pinchers combined in one tool.

An improved feed bag for horses, patented by Mr. Edwin Forbes, of Brooklyn, N. Y., has means for supporting feed bags in a convenient position for horses to eat from without interfering with the natural movements of the head. It consists in a spring arm adapted for connection upon the hames, with its outer end extending over the horse's head, and from which outer end the feed bag is suspended.

Mr. Patrick Gallagher, of Eureka, Nev., has patented an improved fire escape for attachment to buildings, which is so constructed that people can readily escape from the upper stories of burning buildings when the stairways may be rendered impassable by the fire.

Mr. Samuel H. Gregg, of Crawfordsville, Ind., has patented a fence panel formed of a long and short post, twisted wires, and hook headed bolts, arranged and applied in a novel way to form an inexpensive yet substantial fence.

An improvement in vises has been patented by Mr. Fortunato C. Zanetti, of Bryan, Texas. It consists in providing the clamping-jaws, which are secured to the lower end of the fixed jaws of the vise, with a spherical socket and adjusting-screw, to adapt the said jaws to embrace a ball on a standard attached to the bench, to form a ball-and-socket connection between the vise and bench.

Mr. Joseph Seiler, of Norwalk, Conn., has patented an improved device for connecting the mirror standards or supports with a bureau,

in such a way that they can be easily attached and detached.

Mr. Charles F. Harvey, of Van Buren, Ark., has invented an improved attachment for the dashboard of wagons, and other vehicles drawn by horses, for holding the reins. It consists of an adjustable frame attached to the dashboard, supporting a horizontal bar, composed of two parts, the upper part being divided so that the reins can be slipped down between the two parts.

Mr. Samuel V. Kennedy, of New Haven, Conn., has patented a device for removing the metallic primer from an exploded cartridge shell, for applying a new primer, and for closing the shell tightly about the ball after it has been reloaded.

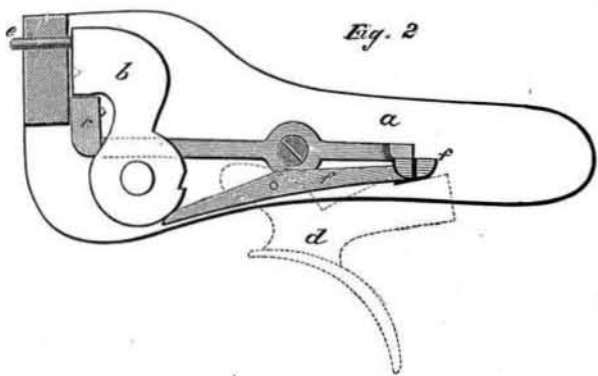
An improved implement for browning coffee, popping corn, and roasting peanuts has been patented by Mr. Stephen M. Poff, of Omaha, Neb. It consists in a pan made with a close top, having a hole in its top closed with a close cover having a perforated slide, three ribs or flanges upon the bottom, and a handle attached to the rear end.

An improvement in gates has been patented by Mr. Alonzo O. Dean, of Bethel, Vt. It consists in a gate post with an iron socket sunk into the ground and braced by extending arms; the gate is hung on rollers pivoted in a frame attached to the post, and provided with a ratchet bar which engages a toothed wheel connected with a helical spring. When the gate is opened the spring is wound up, and retracts when it closes the gate.

Mr. Philip W. Cassil, of New Athens, O., has patented an improved weather strip for doors. The invention consists in the combination with a main strip and the cap strip of bent straps engaging with hooks or staples, and serving to hinge the strip eccentrically to the door.

THE CLIMAX SAFETY HAMMERLESS GUN.

There can be very little doubt now that it is only a matter of time when the hammerless gun, or gun with internal



hammers, will entirely, or almost entirely, supersede the ordinary gun with external hammers. The doubt with regard to hammerless guns has been whether they were as safe to use and as free from accidental discharge as the old style; and this doubt has had some foundation, for many of the hammerless guns are made with a locking bar which secures the triggers only, and allows the hammers to be jarred off and charge exploded when the locks have become worn or light in the pull off.

With the Climax hammerless gun such an accident appears absolutely impossible, for not only are the triggers bolted automatically, but, as may be seen by reference to the engraving, there is a strong block, *c*, which rises in the front of the hammers, *b*, as the gun is opened, which block interposes between the hammers and the strikers, *e*, and thus prevents any chance of the former reaching the striker, and thus exploding the cap. This block, *c*, is operated upon by the trigger, *d*, the pulling of which removes the block, and allows the gun to be fired. So that not only is the gun secure when the triggers are bolted, but even when the gun is placed at full cock ready for firing. No jar or fall can explode the gun, for should the locks be jarred down, the hammers would simply fall upon the safety block instead of upon the strikers.

Too much importance cannot be given to this principle of making a gun secure from accidental discharge when placed at full cock. Probably more than half the accidents that occur with guns occur through some blow or fall, causing the hammers to fall and thus fire the cartridge.

The principle of the Climax hammerless is also particularly well adapted for rifles of various kinds, there being no hammer to catch into anything when deer stalking or pushing through thick brushwood.

The breech fastening of this gun has not only the double grip bolt under the barrels, but also a very powerful grip formed by the top lever engaging a projection at the end of the rib. The lock is made upon the principle of an ordinary side lock, and is so arranged that the locks can be taken off like the locks of an ordinary gun. The rods which force the locks to full cock are completely under cover, so that there is no chance of water reaching the lock work. In this gun the jar given when firing heavy charges from one barrel cannot fire off the other barrel. This is an advantage which will be appreciated by sportsmen who have used large rifles with heavy charges. Fig. 1 in the engraving shows the exterior of the breech and the locks. Fig. 2 shows the internal construction of the lock, and Fig. 3 shows the hammer, *b*, cocked, and the safety block, *c*, in position.

These superb guns are manufactured by Messrs. Holland & Holland, 98 New Bond street, London, England, a description of whose fine workmanship we gave an account in a recent number of the SCIENTIFIC AMERICAN.

The Life of Railways and Rolling Stock.

The report of the Illinois Railroad Commissioners contains the following data concerning the average life of the rolling stock and superstructures of twenty-six roads: Locomotives,

15 1/4 years; passenger cars, 15 1/4 years; stock cars, 10 years; freight cars, 11 1/2 years; iron rails, 7 years; steel rails, 14 years; oak ties, 7 years; pine ties, 4 1/4 years; cedar ties, 5 1/2 years; truss bridges, 9 1/2 years; trestle bridges, 8 years; pile bridges, 9 years; joints and fastenings, 7 years; fencing, 8 1/2 years. One road gives the life of its locomotives as 8 years, and of passenger cars 15; another road reports the former at 24 years, and the latter at 20. Only one road puts the life of passenger cars as high as 20 years, and the lowest reported life rate of such cars is 8 years. The shortest life of iron rails is 3 years, and the longest 12; four roads report it as 10 years. Only four roads report the life of steel rails, and they give it as 9, 12, 15, and 20 years respectively. These data differ considerably from those of roads in other sections of the country.

Alizarin Blue.

G. Auerbach recently read a paper on this subject before the Chemical Society, London. He states: About eighteen months since a blue coloring matter was brought into the market as a substitute for indigo. It is now disused on account of its high price and its unstable nature when exposed to sunlight. The researches contained in this paper were finished in May, 1878. The author gives a résumé of previous work on the subject, and recommends the following method of preparation: 1 part of dry mono-nitro-alizarin, 5 parts concentrated sulphuric acid, and 1 1/2 parts of glycerine (sp. gr. 1.262), are mixed and heated gently. Reaction commences at 107° C., becomes violent, the temperature rising to 200°. Much frothing takes place, with evolution of sulphurous acid and acrolein. The whole mass, when frothing has subsided, is poured into water, boiled up and filtered, the residue being boiled out three or four times with dilute sulphuric acid.

The mixed filtrates are allowed to cool, and the blue separates in brown crystals. These are purified by mixing with water and adding borax till the solution becomes brownish violet, the blue with the boric acid forming an insoluble compound. This residue is washed, decomposed with an acid, and the pure blue obtained as a violet silky paste. If required perfectly pure, it must be crystallized successively from its various solvents, high boiling naphtha, amyl alcohol, and glacial acetic acid. When pure it forms brown shining needles, melting 268-270°. It has the formula C₁₇H₁₁NO₄. Salts were prepared and analyzed, but the results were not satisfactory, as it was difficult to obtain them quite pure. Bromine derivatives were also prepared and examined. The action of chlorine, zinc dust, acetic anhydride, etc., have also been studied. The author discusses the constitution of the blue, and thinks it must be closely related to the aldehydines discovered by Ladenburg, which are formed when aromatic orthodiamides act upon aldehyds.

Ammonia on Brass.

John Y. McLellan, of Glasgow, writes to the *Chemical News* as follows:

While experimenting on the action of liquor ammonia on various metals and alloys, with a view to determine the most suitable for the contraction of a certain part in an ammonia plant, I have met with a reaction on brass which, so far as I know, has not before been recorded and of which this note is a preliminary notice. If a small piece of brass or a few brass turnings be covered with liquor ammonia, sp. gr. 0.880, in a closely fitting stoppered bottle, and placed aside for a few days, it will be found that the ammonia has acted on the



HOLLAND'S CLIMAX SAFETY HAMMERLESS GUN.

copper of the brass to such an extent as to produce a solution of a more or less characteristic violet color, due to the presence of oxide of copper held in solution by ammonia. If this solution be still allowed to remain undisturbed for a few days longer free from contact with the air, this violet color will gradually disappear, leaving a colorless solution, which, however, is no sooner brought into contact with the air by removing the stopper than the violet color is reproduced, and by again stopping the bottle and leaving it aside the same reaction occurs and may be reproduced over and over again.

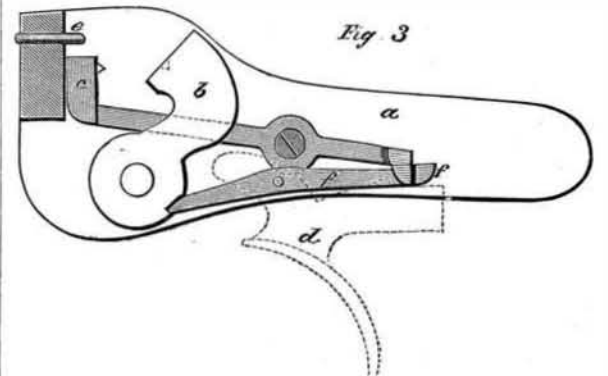
The production of the violet color from a colorless solution

on exposure to the air does not seem to be the result of oxidation, as on opening the bottle in an atmosphere of carbonic acid the same reaction takes place.

I am at present working up this subject in the hope of finding in what state this colorless solution of copper exists.

Household Perils.

Under this head the *Boston Journal of Chemistry* names several dangerous substances which find their way into households. There are two or three volatile liquids used in families which are particularly dangerous, and must be employed, if at all, with special care. Benzine, ether, and strong ammonia constitute this class of agents. The two first named liquids are employed in cleansing gloves and other wearing apparel, and in removing oil stains from carpets, curtains, etc. The liquids are highly volatile, and flash into vapor so soon as the cork of the vial containing them is removed. Their vapors are very combustible, and will inflame at long distances from ignited candles or gas flames, and consequently they should never be used in the evening when the house is lighted. Explosions of a very dangerous nature will occur if the vapor of these liquids is permitted to escape into room in considerable quantity. In view of the great hazard of handling these liquids, cautious housekeepers will not allow



them to be brought into their dwellings, and this course is commendable.

As regards ammonia, or water of ammonia, it is a very powerful agent, especially the stronger kinds sold by druggists. An accident in its use has recently come under our notice, in which a young lady lost her life from taking a few drops through mistake. Breathing the gas under certain circumstances causes serious harm to the lungs and membranes of the mouth and nose. It is an agent much used at the present time for cleansing purposes, and it is unobjectionable if proper care is used in its employment. The vials holding it should be kept apart from others containing medicines, etc., and rubber stoppers to the vials should be used.

Oxalic acid is considerably employed in families for cleaning brass and copper utensils. This substance is highly poisonous, and must be kept and used with great caution. In crystalline structure it closely resembles sulphate of magnesia or Epsom salts, and therefore frequent mistakes are made and lives lost. Every agent which goes into families among inexperienced persons should be kept in a safe place, and labeled properly and used with care.

Congress of American Potters.

The sixth annual convention of the Potters' Association of the United States began in Cincinnati, Ohio, December 2. About a hundred manufacturers were present, representing all the prominent centers of the industry. The secretary reported that the past year had been an eventful one in the history of the ceramic art in this country. Never before had more rapid advances been made in any department of industry. Additions and improvements have been made to nearly every pottery in the United States. Several new ones have been built, and others are soon to be erected. Each manufacturer has seemed determined to succeed, and, bending all his energies to that end, the result has been a success far surpassing the most sanguine anticipations. With increased knowledge has come increased power, and the result may be seen in the quality and beauty of our productions, which are rapidly taking rank with the best products of other lands, and the old prejudice against American ware is now nearly a thing of the past. Especially in the decorative department has the improvement been marked. The demand for this class of goods has rapidly increased, and American artists have succeeded in producing results never before accomplished in this country. Some of the lady artists of Cincinnati are

fast gaining a national reputation for their beautiful work. We need in this country more art schools. The success of our industrial and commercial interests depends largely upon this. A cultivation of taste and a love of art would create a demand for wares of higher artistic order, and thus build up an industry which might in time rival the most beautiful productions of Europe. This holds good not only in the ceramic, but every department of industrial art.

FIVE SUNDAYS IN FEBRUARY.—It is interesting to note that in February next there will be five Sundays. This occurs but three times in a century.