MORE WORK FOR INVENTORS.

It would fill a large volume to give even a brief mention of the various ways in which inventors have earned the title of public benefactors. What they have done in the way of life saving inventions alone entitles them to the gratitude of the human race. The misery and suffering that have been prevented by these men of brains is beyond calculation, and all mankind are looking to them for a continuance of their labors. An inviting field of labor is to promote safety to railway travelers and operatives. Notwithstanding the fact that recent improvements have made travel by rail one of the safest means of transportation, the loss of life and limb—not to mention property—on railways is something serious, and it remains for inventors to diminish the number of railway disasters as far as possible.

The *Railway Gazette* reports: "Killed in the year ending with October, 1881, 397; injured, 1,687. Year ending October, 1882, killed, 401; injured, 1,466." Some of these casualties were unavoidable, but many of them might have been prevented by the use of properly arranged safety appliances. Among the accidents reported for October last were six collisions from misplaced switches. It will be understood that safety switches will not prevent this class of accidents. A train takes a siding to let another train pass, and the switch is not changed. A train running in the same direction as the one side tracked must inevitably collide with the latter, if not stopped in time to prevent it. In such cases the only sure preventive would be an automatic signal connected with the switch in such a manner that the engineer of the coming train would be warned in time to prevent a collision. It is, by many, considered sufficient protection, where no safety switch is used, to signal trains that would run off the ends of the rails at a stub switch; that is, trains running in a direction opposite the way the frog points. A train running toward the point of a frog cannot derail on account of the position of the switch, as it must follow one track or the other, but the derailments occur to trains running toward the head of the switch. This is the kind of derailments the safety switches are designed to prevent, and where they are in use no signal is needed in that direction, but in the opposite one to *warn trains running toward the point of the frog*. Of course, the signal should be placed far enough from the switch to give time to control the train, and this signal would perform a double purpose, viz.: If the engineer desired to keep the main track, and the switch was turned to the siding, the gong (or other signal) would warn him to stop. If, on the contrary, he wished to go on the siding, he would know the switch to be right, and he could proceed "with caution." But here comes the need of another signal—to warn him in case there is a train already on the siding, and this, to be reliable, must also be automatic, and operated in some manner by the train occupying the siding. The aim in providing switch signals should be directed as much in the direction indicated by the point of the frog as in the direction pointed out from the "heel" to the "head" of the switch. Indeed, the former is of the greater importance, as some of the most horrible disasters on record have been caused by collisions resulting from misplaced switches which threw trains on the siding where other trains were standing. Trains running in the other direction over a misplaced switch (other than the safety switch) will be derailed, but such accidents are not usually as serious as the collisions. By providing the most approved safety switches, derailments of this nature will be prevented, and when we have proper signals, collisions from misplaced switches will be heard of no more.

Much destruction of life and property is caused by spreading of rails. Accidents from this cause are usually disastrous, for the reason that trains are usually running at a rapid rate, when spreading of rails is the cause of derailment. In classifying the causes of railway accidents, those assigned to this one may properly be charged to "defect of road," which in turn may be set down to defective management. It is not easy to determine the cause of rails spreading sufficiently to allow the wheels to leave them, without exhibiting signs of spreading long enough before an accident could happen to give ample time to make them secure There are various causes for the gradual widening of the gauge of the track, such as flange wear, yielding of spikes to lateral pressure in soft ties, an insufficient number of ties and spikes, rails out of surface, etc. These combine to spread the track gradually, but it must be the worst type of mismanagement that would fail to see and remedy this in time to prevent disaster. It requires a spread of 3½ inches to allow wheels to drop between the rails; and although old tracks are always more or less wide of the true gauge, for reasons stated above, it seems out of keeping with the present system of railway management to allow a track to spread enough to cause mischief. But inasmuch as the facts are before us, a remedy must be sought for, which it seems can only be found in some improved method of rail fastening. It is clear that if the ordinary ties and spikes will not hold the rails securely, some other means of fastening must be resorted to, and it belongs to inventors to provide the means. That we allow track to spread is not to our credit as engineers, mechanics, or railway managers. In October last, six cases of spreading of rails are reported, which killed one conductor, and injured three other train men, and damaged rolling stock to the extent of many thousands of dollars A moderate expenditure for improved rail fastenings would have prevented all this and much that has gone before.

The same month shows up twelve accidents from cattle on track. It may not seem clear how inventors could have reduced the number of accidents from this cause; but it is possible to largely diminish accidents from this cause. The following is a summary of the *Railroad Gazette* report of October accidents from cattle on track:

On the Rio Grande and Pecos Valley road, a construction train ran over a cow, throwing five cars from the track.

A passenger train on the Mont Alto road, Pa., ran over a cow; one car was upset; injuring nine passengers, four of them seriously.

A passenger train on the Midland North Carolina road ran over a cow, throwing off several cars and injuring a brakeman.

On the Chesapeake and Ohio road, a freight train ran into some cattle, throwing the engine and several cars down a bank. The engineer and fireman were killed.

On the Chicago, St. Louis, and New Orleans road, a freight train ran over a mule, and fourteen cars were piled up in a bad wreck, and a brakeman was killed.

On the Indianapolis and St. Louis road, a passenger train ran over a cow, throwing the engine and baggage car down a bank. The fireman was killed.

On the Louisville and Nashville road, a passenger train ran into some cattle, throwing the whole train from the track, killing the fireman and injuring eight passengers.

A passenger train on the Texas and Pacific road ran over a cow, throwing the engine down a bank and into a creek. A brakeman was killed and the fireman hurt.

A construction train on the Denver and South Park road ran over a cow and was thrown from the track and down a high bank, killing the conductor and two laborers.

A passenger train on the Missouri Pacific road ran over a cow, throwing the whole train from the track and killing a brakeman.

A freight train on the Louisville and Nashville road ran over some cattle, throwing the whole train off and killing the engineer and a brakeman. [This makes two accidents for that road in October.]

A passenger train on the Wilmington and Weldon road ran over a cow, and the engine and two cars were thrown from the track.

The above statement is summarized here to give inventors an idea of the value of an invention that will prevent such disasters. It is not expected that *all* such accidents can be prevented, but it is believed that much good would result from well-directed labor in this direction.

With poor fences, or no fences at all, cattle will trespass, and this is something that human ingenuity cannot prevent, but it would seem that more efficient cattle guards might be contrived which would prevent stock leaving the highways and trespassing on the railways, as they frequently do. Improved cattle guards would contribute somewhat to safety, but the pilot or "cow-catcher" is the objective point of inventors. It is morally certain that stock will get in front of the locomotive, and, unless such obstructions are met under the most favorable circumstances, great damage is done. The pilots on most locomotives allow animals to roll under the wheels instead of throwing them to one side. Of course, it is necessary to have a certain amount of clearance below the pilots, but many of them are much higher than is necessary to clear frogs and crossing planks or whatever comes above the surface of the rails. The "noses" of most pilots point too much skyward for the successful removal of animals from the track, and what is wanted is a "cow-catcher" that will not *run over* animals, but cast them to one side. Some wheel fenders should also be provided for the truck wheels, so that in case the pilot fails to perform its duty the wheels will encounter no obstacles, either animals or other obstructions. In these days of train-wrecking the pilot has responsibilities aside from removing animals from the track, and it is sadly in need of the earnest attention of inventors.

The amount paid annually by railroad companies for stock killed without doing damage to railway property is counted by hundreds of thousands of dollars, much of which may be saved by more efficient cattle guards. And it will be seen from the foregoing statement that the cost of life and limb, together with the destruction of property annually from "cattle on the track" is enormous, and a fortune is in store for those who will do the needful in the premises.

SAWING HARD STEEL WITH SAND.

The practice of mechanics is largely a series of experiments, some successive and cumulative and others isolated and independent. Some months ago a mechanic wished to cut some very narrow slots in a bar of steel that was hammer-hardened, and it was desirable that it should not be annealed and rehardened, because of the danger of disturbing the relative widths of the slots. The workman tried the ordinary saw, or thin rotary milling tool, but found it to be impossible to keep an edge. After many ineffective trials, he recollected having witnessed the sawing of stone with sand urged by sheet iron blades. He substituted a soft iron disk for his steel saw, and, procuring some moulding sand, he had the satisfaction of seeing progress made in the obdurate steel. By changing the moulding sand for fine quartz sand and using a disk of Muntz sheathing metal, feeding the sand with water, he performed the job in a most satisfactory manner.

Since that time he has experimented with disks of lead and antimony, of copper, plate brass (rolled), sheet iron, and the Muntz metal. He gives the preference to the latter, and has succeeded, by using three thicknesses of the metal, to cut a wide "kerf," in slotting more than one-quarter of an inch wide. In a width of these dimensions he prefers to score the edge of the disk so that one portion of the cut will be recessed while the other is advanced. The speed must be necessarily moderate—about that of turning iron in the lathe—or the sand and water would be thrown out of the cut before they could do their work.

The quality of the work varies, of course, with that of the cutting material employed, emery and oil not being used advantageously because of their cutting the saw faster than they do the more obdurate material. Quartz sand of various degrees of fineness appears to give the best results, and it seems to be necessary that the disk should be softer than the material to be cut. It is understood, of course, that the disks are not serrated like a circular saw, but are smooth on the edge. Indeed, their action appears to be precisely like that of the toothless blades used in sawing blocks of marble and other stones; they merely push the cutting sand against the material, or perhaps to a certain extent receive and temporarily hold it embedded in their softer material.

Cheapened Aluminum.

The improved process of producing the metal aluminum, recently reported from England, does not cheapen the product anywhere near enough to bring the metal into serious competition with iron. The inventor, Mr. James Webster, of Hollywood, near Birmingham, Eng., claims, however, to have found a way to solder and weld the metal. If this claim is true, and the methods are practicable, the improvement is likely to greatly extend the usefulness of the "coming" metal.

Mr. Webster's process of reducing the metal is described as follows:

A given quantity of alum and pitch, which are first finely ground, are mixed together and placed in a calcining furnace, by which means 38 per cent of water is driven out, leaving the sulphur, potash, and alumina with oxide of iron. The calcined mixture is then put into vertical retorts, and steam and air are forced through, which leaves a residue of potash and alumina only. This residue is afterward placed in a vat filled with warm water, which is heated with steam. The potash is thus leached out, and the alumina left as a deposit. The potash liquor is then run off, boiled down, while the alumina precipitate is collected in sacks and dried. It is then ready for making chloride of aluminum. The alumina deposit thus obtained contains about 84 per cent of pure alumina, while that which is obtained by the old process of precipitation has only 65 per cent. Mr. Jones, the Wolverhampton borough analyst, certifies that the constituents of Mr. Webster's alumina deposit are as follows: Alumina, 84·10; sulphate of zinc, 2·68; silica, 7·40; water, 4·20; alkaline salts, 1·62. In order to complete the process and convert it into aluminum, the chloride of aluminum is treated with sodium, in order to withdraw the metal. Aluminum is afterward alloyed with copper, silver, and other metals. It is used for the manufacture of bismuth bronze, aluminum bronze, or any other alloys.

Inventions and Inventors.

At a recent meeting of the members of the London Association of Foremen, Engineers, and Draughtsmen, Mr. E. G. Swann read a paper entitled "Inventions and Inventors." He said that inventions had either been accidental or elaborated by study and research. The invention of gunpowder, printing, and mechanism were the results of study and research. All inventors had been benefactors of the world in their respective degrees. The patent laws had long been a subject of discussion, but the question was, Would it not be better, after all, to abolish the patent laws altogether, and to secure the rights of inventors by simple registration of first publication, in the same way as the rights of authors, artists, and designers were secured? Assuming that the patent laws were to be preserved or continued, he suggested that, in anticipation of international patent laws, they should adopt the seventeen years' term in force in the United States. Then the full term should be divided into five sub-terms: the first of five years, on a payment of £10, and the other four of three years each, on a payment of £5, making in all £30, and a month's grace, subject to a fine of £1, to be allowed in each sub-interim. He would have no examination into the novelty of the patent, and he would have all patents classified, condensed, and indexed up to within six months, and announced in a weekly illustrated journal to be filed in every town, either in the public library or principal post-office. All fees should be paid in adhesive stamps, to be canceled only at the Patent Office; and all assignments to be void unless registered at the Patent Office, which could be done on the payment of a fee of 10s., and the register to be open for inspection on the payment of 1s. as a stamp fee. He would have all Patent Office employés to hold office during good behavior. The government should pay a royalty for the use of any patented invention; and, finally, all disputed questions about patents to be decided by a special tribunal for the special purpose. He believed that in the present day nine inventions out of ten turned upon mechanical contrivances. He proceeded to say that science itself had borrowed its resources and arrived at the precise disclosure of facts to solve obscure problems from mechanical appliances, until at length some points were reached at which all branches of knowledge and all varieties of skill became naturally reflective, auxiliary, and accelerating.

Oil Refining.

The apparatus employed for separating the various ingredients contained in crude petroleum in the process of obtaining kerosene consists of an iron still having a wrought iron worm pipe, which is submerged in a tank containing cold water. The still having been filled with crude oil, a fire lighted beneath it causes the oil to boil and drives off the more volatile vapors, which at ordinary temperatures pass over without being condensed. By surrounding the coil with ice, or by compressing these gases by means of an air pump, they may be condensed into the form of very volatile liquids, termed rhigolene and chymogene.

After these have been eliminated, the vapors begin to condense in the coil, the resulting oil being received in a tank at its farther end. That first formed has a gravity of 95° Baume, but the product becomes heavier as the process proceeds. It is usually customary to direct the stream into one tank until the gravity reaches from 65° to 59° B., forming crude naphtha, when it is diverted into the kerosene tank, into which it is allowed to flow until a gravity of about 38° B. is reached, or the oil becomes of a yellow color. This second fraction is the burning-oil, which requires a farther purification to fit it for use. The stream is next directed into the paraffine oil tanks, and allowed to run until nothing remains in the still except coke. When, however, very large stills of 1,000 barrels capacity or upward are employed, the distillation is stopped when the residuum has attained a tarry consistence, the remaining oil being extracted in smaller stills.

By slow distillation in high stills, the production of the heavier oils may be avoided, they being "cracked" into lighter oils, so that only crude naphtha, kerosene, and coke result.

The burning-oil is purified by the addition of about ten per cent of sulphuric acid to improve the color and deodorize it. The acid is poured into the oil and the liquid thoroughly agitated and then allowed to stand, when a dark tarry residuum separates. This is removed, and the clear oil is then agitated with water and afterward with caustic soda or ammonia. This neutralizes any remaining traces of acid, and is removed by water. In some instances it is then heated to expel a small proportion of naphtha or benzine which it may contain, or is redistilled.

The crude naphtha is redistilled for gasoline, benzine, or refined naphtha, or is poured into the oil wells, nominally for the purpose of cleaning them. In some instances it is used for adulterating the crude oil sold to the refiner.

In the details of the process of refining, manufacturers somewhat differ. Some blow steam through the crude oil, thus taking off the naphtha previous to distillation. In other instances, the heavier portions of the distillate are separated, forming safer oils than those in ordinary use. Thus, "astral oil," averaging 49° B., flashes at 125° of Fahrenheit's scale, and "mineral sperm," having a gravity of 36° B., only yields inflammable vapor at temperatures above 262°.

Oil which flashes at or above 100° F., is considered safe for ordinary use, but the temptation to allow the heavier portion of the crude naphtha, an article which commands a much lower price than oil, to flow into the tank designed for the latter is so great that many kinds of oil in the market are very dangerous, their vapors exploding at a much lower point.

Instead of continuing the flow of naphtha into its proper tank until a gravity of 58° or 59° B., is attained, it is diverted into the burning-oil reservoir while yet as light as 63° to 65°.

Dr. White, of New Orleans, found that one per cent of naphtha added to an oil which flashed 133° F. caused it to flash at 103°; with 2 per cent added it flashed at 92°; with 5 per cent at 83°; with 10 per cent at 59°; and with 20 per cent at 40°.

Ordinary kerosene, having a gravity of 47° B., flashes at 86° F. An oil which will not flash below 100° may be made by running off the naphtha to 58° B., and exposing the oil in shallow tanks to the sun or a strong light for a day or two.

The average yield of crude Pennsylvania oil is stated to be: Gasoline 1½, refined naphtha 10, benzine 4, refined petroleum or kerosene 55, lubricating oil 17½, paraffine 2, loss, gas and coke, 10, total 100.

By "cracking" it can be made to yield: Crude naphtha 20, burning-oil 66, coke and loss 14.

The method for ascertaining the degree of heat at which the hydrocarbon vapors of petroleum are liable to explode consists in heating the oil in a porcelain vessel surrounded by a hot water bath. A wire is placed a quarter of an inch above the rim of the vessel, and when a thermometer whose bulb is submerged 1½ inches below the surface of the oil indicates the desired heat, say 90°, a small flame is quickly passed along the wire over the surface of the oil; if no flash is produced, the heat is continued and the test applied at every 3° above this until the flashing point is reached. The operation is then repeated with a fresh sample of oil, fresh water being used in the outer vessel, the source of heat being removed when a temperature approaching that obtained in the first experiment has been reached. This is the English method, but there are other ways of testing petroleum employed in this country, which are, however, similar in principle, and nearly so in detail, to that described above.—*Glassware Reporter.*

THE Madrid Mining and Metallurgical Exhibition is announced to open in the Park of Madrid on April 1, 1883.

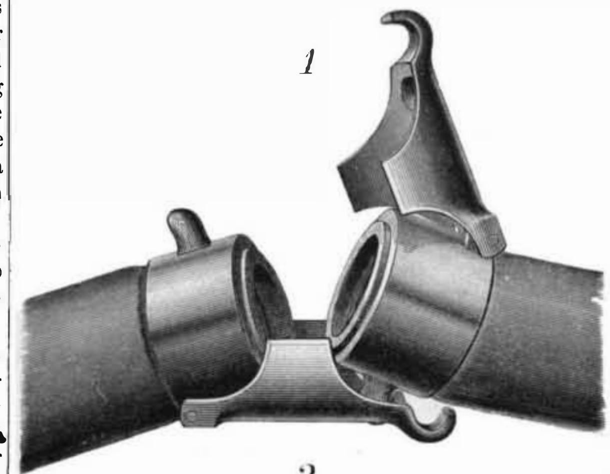
Estimation of Tannin.

G. Simand has been experimenting on Lowenthal's method of estimating tanning by glue or gelatine, in the Vienna Laboratory of the experiment station for the leather industry. As he could not obtain concordant results within it, he had recourse to the use of hide or tissues that contain glue. His experiments are described in *Dingler's Journal* (cxlvi., 133). Unoiled violin strings were used by A. Girard with still better results. The commercial tannic acid contains variable quantities of tannin, and hence cannot be used in these comparative experiments.

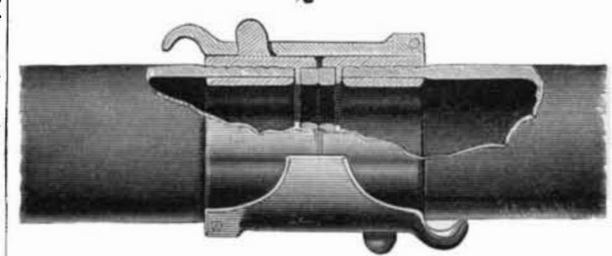
NEW HOSE COUPLING.

The difficulties attending the use of the old fashioned hose coupling are too well known to require mention here. The time consumed in effecting a union of the lengths of hose,

1



2

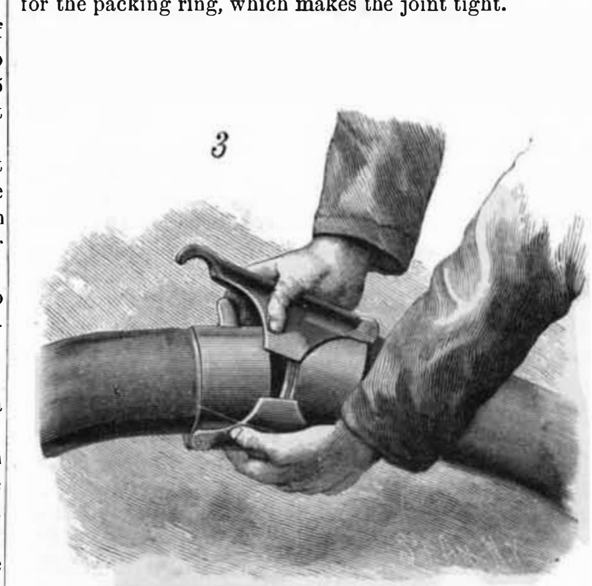


CASSEDY'S HOSE COUPLING.

the necessity of having the right ends together, the use of a spanner, and the great liability to injury are all serious objections to the common form of coupling, which are obviated by the invention illustrated by the annexed engravings, in which Fig. 1 shows the coupling partly united. Fig. 2 shows it united, and partly broken away to exhibit the packing rings, etc. Fig. 3 shows the manner of coupling.

The two halves of the coupling are exactly alike, so that it makes no difference how the ends of the hose sections are arranged. Each half of the coupling has a latch hinged to it, which partly encircles it, and is apertured near its free end to fit over a beveled rib on the other half of the coupling. In the face of each half coupling there is an annular space for the packing ring, which makes the joint tight.

3



CASSEDY'S HOSE COUPLING.

This coupling is adapted to steam as well as water pipes where a temporary connection is required. It has been tested at a pressure of 225 pounds per square inch, and is steam, air, and water tight. One person can connect and disconnect it without the use of tools of any description. It can even be done readily in the dark, and requires only an instant to couple or uncouple it. There is no possibility of its flying apart. A complete coupling for a 2⅝-inch hose weighs only 5 pounds.

Hon. W. B. Miller, 160 West State street, Trenton, N. J., is agent for this coupling. Messrs. Williams & Cassedy, of Cape May City, N. J., are proprietors.

Tests for Light.

Dr. Koenig has been making a number of experiments on the quality of different kinds of light by means of the leucoscope, an instrument of his invention. It consists of a rhomboid of calcspar, a quartz plate, and a Nicol's prism. When a ray of light enters the spar it is split into two rays, polarized at right angles. These traverse the quartz and Nicol. When analyzed they show two spectra of absorption bands. and the peculiarity is that where the bands occur in one, the other spectrum is of pristine brightness, so that the two spectra overlaid give a continuous spectrum. The number of bands is increased by increasing the thickness of quartz, and they can be shifted by rotating the Nicol. It is possible, therefore, by rotating the Nicol, to make the colors in each spectrum produce white light together. When different kinds of light are examined by the instrument, different amounts of rotation of the Nicol are required to bring the two spectra into conformity, and the angles of rotation are a gauge of the color-quality of the light examined. According to results communicated to the Physical Society of Berlin, Dr. Koenig finds that the angle for stearin candles is 71·20 deg., for gaslight 71·5 deg., for electric arc light 79 deg., for magnesium light 86 deg., and for sunlight 90·5 deg. For burning phosphorus and the Drummond lime light the angles were between gas and the electric light. It thus appears that the magnesium light more closely resembles sunlight than that of the electric arc, a result confirmed by the fact that the aniline dyes, hardly distinguishable by gaslight, can all be distinguished by the arc light, except a few "bronzes," and even these are clearly distinguishable by magnesium as by sunlight. Dr. Koenig has also tested Swan and Edison incandescence lamps, and finds that the luminosity increases at first in a much greater rate than the current increases; doubling the strength of current very largely increased the luminosity. The highest angle reached was 78, or very nearly that for the arc lamp. These researches are of much interest. They indicate the excellence of magnesium as a standard light giver.

Action of Poisons on the Petals of Flowers.

A. Anthony Nesbit, F.C.S., states in the *Journal of Science* that he has made some experiments on the action of various substances on the life of flowers, and for this purpose selected some of the best known alkaloids, viz., strychnine, solanine, digitaline, quinidine, atropine, quinine, cinchonine, picrotoxine, aconitine, brucine, and morphine, using one-quarter per cent and one per cent solutions. The alkaloid of tobacco being very difficult to obtain pure, owing to its rapid oxidation, 5 per cent and 20 per cent solutions of tobacco (bird's eye) were used in its stead. The flower chosen for experiment was the narcissus, and the results showed that there was here a wide field for long and patient investigation.

Of all the twelve solutions, tobacco proved, in a very marked manner, to be most destructive to the life of the flower of the narcissus; the remaining eleven poisons, though but slowly injurious, nevertheless in some instances showed marked difference of effect, or, it may be said, symptom. Thus strychnine, next in poisonous power to tobacco, drew the petals upward, and made them dry and brittle, symptoms also exhibited by solanine poisoning, while quinidine and several other alkaloids rendered the petals limp and rotten. Morphine, one of the least poisonous (to the narcissus) of the alkaloids experimented with, without destroying the flower, curiously enough imparted to the petals a flaccidity resembling that of the petals of the poppy.

A Gasoline Engine.

A petroleum motor, or rather an engine for obtaining motive power from an explosive mixture of gasoline vapor and air, has been constructed by a Hanoverian firm, and is described by Professor Schottler in the *Wochenschrift des Vereins Deutscher Ingenieure.* The working cylinder is 8 inches in diameter, with 14⅜-inch stroke. The design of the machine is similar to that of a type of gas-engine constructed by Wittig and Hees. The gasoline is led through pipes to the pump cylinder, where it mixes with a definite proportion of atmospheric air. The mixture is then compressed and forced into the working cylinder, where it is ignited by a lamp separately supplied with oil. In four trials with the particular engine in question, the maximum force obtained was 4·5 horse power, with 130 revolutions per minute. The consumption of spirit of sp. gr. 0·675, was at the rate of 1¾ to 2½ pints per horse power per hour. The value of the material is estimated at 1⅝d. per pound weight; and the machine is stated to require as little attention and to work as cheaply as a gas engine.

Silico Copper Electric Wire.

Owing to its greater strength phosphorus bronze is used sometimes instead of copper for conducting electricity, since much smaller wire possesses the necessary strength. The resistance offered by phosphorus bronze is considerably greater than that of copper, so that while it answers well for telephone wire it is not adapted to long telegraphic lines. L. Weiller, of Angoulême, has recently alloyed copper with silicon instead of phosphorus, and made a silicon bronze, the conductivity of which is twice that of phosphorus bronze, while its strength is not less, and hence seems well adapted to electric conductors. The relative strengths of copper, silico bronze, and phosphorus bronze are as 28, 70, and 90; conductivity as 100, 61, and 30.