operation is performed. It is of the utmost importance that the flow of air through the grate should be free as possible, and, therefore, the slicing should be done thoroughly, but as quickly as practicable. This is a point, however, which is more generally complied with than the more important ones above insisted upon.

A difference of twenty-five per cent in economy between good and bad firing might undoubtedly be often discovered; and, we believe, that with the greater proportion of large-sized boilers used in this country, the wages of skillful firemen might be doubled or trebled with profit, rather than substitute for such men those who are either ignorant of their duties or unfaithful.

ARTIFICIAL STONE.

The future material for houses and engineering structures in this country is evidently artificial stone. The wages of stone cutters and the high price of labor generally must determine this question. It may be well, therefore, to consider some of the inventions, that have been made within the last few years, looking to a solution of the important problem. Artificial stone can now be made in Europe of undoubted strength and durability, and cheaper and better than hewn stone. We understand that in this country satisfactory experiments have been made, and there is every probability of a general acceptance of this material as soon as the public are made aware of all the facts of the case.

We do not propose to enter into a history of all of the mortars, cements, concretes, and the like, that have been made since the time of the Romans, but to speak of some of the modern experiments that have attracted the most attention from engineers. Perhaps the best known cement or artificial stone is the *Béton-Coignet*. We have had occasion to witness the preparation of this celebrated building material in Paris, and have examined some of the constructions in that city and elsewhere, and can therefore speak from personal observation. *Béton* was introduced into France about thirteen years ago, by M. Coignet. There was much opposition to it at first, and it was only cautiously tried on constructions of little importance.

This caution was well founded, as the first mixture was unsatisfactory, because it was made of coal cinder with lime, and was not found to work well. By progressive experiments and changes of constituents, M. Coignet finally hit upon a mixture that was able to resist all extremes of weather, and to withstand the severest tests that could be applied to it. It is of this invention that we propose to speak. *Béton-Coignet* is a mixture of a large proportion of sand with a small percentage of lime, to which is added a little cement, the quantity of the latter varying with the amount of hardness or the rapidity of setting required; it may be said to be an artificial stone, formed of sand, lime, and water, capable of being used in blocks or in continuous masses, for foundations, walls above and below ground, sewers, water pipes, floors, pillars, arches, embankments, aqueducts, reservoirs, cisterns, and the entire walls of buildings, bridges, tunnels, flagging, and, in fact, all structures ordinarily made of brick or stone. It is a mortar in which only a very small quantity of water is employed to moisten the lime and sand, and in which the materials are ground in a mill to a stiff paste, and compacted into forms by heavy blows of a peculiarly constructed mallet. As we witnessed the operation in Paris, it did not appear any more difficult than ordinary mortar making, only that there was more machinery used in the *béton*.

On the average, 1·31 bushels of the mixture of sand, lime, and cement, make a cubic foot of *béton*, which will weigh about 140 pounds, and offer a resistance of 2½ tuns per square inch; while ordinary mortar, formed of the same constituents, will exhibit very insignificant powers of resistance. It will be seen that the weight of a cubic foot is less than that of ordinary building stone, while its resistance to pressure is greater. In mortar, a large quantity of water is employed, and this, on drying, leaves a porous mass, which possesses very slight resisting power. The cost of *béton* in Paris, two years ago, was from $5 to $8 per cubic yard. We have in former numbers of this journal given some account of the manner in which artificial stone is made, but the revival of interest in the subject will warrant us in refreshing the knowledge of our readers on the subject. Great care should be taken in selecting the ingredients. The lime should be hydraulic, in fine powder, well screened to preserve it from lumps; and river sand should be used when feasible. The grinding mill employed in France is not unlike the one used in porcelain manufactures. It consists of an iron cistern, the bottom of which is perforated, and in the center of which revolves a vertical shaft, armed with knives, and a board, which in each revolution discharges a part of the paste. There is a penstock covering the outlet, to regulate the discharge of the *béton*. The ingredients are measured into the mixing mill in barrows, and during this process, small quantities of water are gradually added. Very much depends upon the care bestowed upon this part of the work, as it is essential that every particle should be moistened, in order that the setting may be more rapid and the stone become harder. As good or bad bread can be obtained from the same flour, according as the kneading is well or imperfectly done, so a hard or a crumbling cement can be made by entirely or partially moistening and mixing the ingredients. The plastic material from the mill is thrown into a mold in thin layers, and each layer, as it is laid on, is beaten and compressed by the regular and even blows of a sixteen pound hammer. The successive layers are cross cut, as in plastering, in order to insure their firm adhesion. The form of the mold must depend upon the proposed use of the stone. In buildings it may consist of close boarding, kept in place by cross bracing, and may be made to carry complicated ornaments, cornices, and tracings, that would be very expensive if they were to be wrought out of solid stone. Fine specimens of statuary have been made of the well mixed material. The arches of the basement to the Paris Exhibition of 1867, which constituted a perfect labyrinth, and were of great extent, were formed of five parts sand, one of lime, and one fourth cement. In no other way could these vast constructions have been completed in time for the exhibition. They were visited by thousands of persons interested in the subject, and did more to dispel doubts and satisfy engineers than any previous works constructed of this material. The work was done with amazing rapidity, as the centering was often struck within ten hours after the *béton* was got in place, and the passages were ready for service in four or five days after their completion. The embankment at the Trocadero in Paris, for a quarter of a mile, is supported by a wall of *béton* forty feet high, and one of the bridges over the Seine is built entirely of the same material. In Egypt, the very sands which threatened to destroy the Suez Canal have been appropriated to the manufacture of sea walls, embankments, lighthouses, and vast constructions, by this system of Coignet.

In view of all these facts, it is not surprising that so much attention should be bestowed upon artificial stone in this country. It cannot be long before we shall discover a cement equal to the best Portland, and the ingenuity of our inventors will soon supply improved machinery for working up the ingredients. In the construction of the sewers, boulevards, and heavy embankments of the upper part of the island of New York, it is worth while to consider whether the artificial stone is not the best material that could be employed. In the far West, where stone is scarce, there can hardly be a doubt as to the value of *béton* for building purposes. We have chiefly confined our remarks to the *béton*, because that is most familiar to us, but we do not intend to disparage other inventions, which are making their way to popular favor, and appear to be worthy of all that has been said in their praise. The subject of artificial stone is well worthy the attention of our engineers.

SUGGESTIONS FOR THE IMPROVEMENT OF RAILWAYS.

As usual after the occurrence of any severe railway accident, the recent disaster on the Hudson River Railway has showered upon us a large number of suggestions relative to the improvement of railways and their management, so as to obviate such disasters in the future. A great many of these suggestions emanate from men who have no practical knowledge of railroading, and so little theoretical knowledge as to render their suggestions of no value.

There are others, however, worth consideration. A Boston correspondent, referring to the numerous accidents which have lately occurred in depots, by passengers stepping into or off from cars in motion, thinks railroad companies are morally, responsible, if not legally so, for accidents of this kind, since such accidents, resulting from carelessness or imprudence of passengers, might be prevented by a change in the construction and arrangement of platforms in the depots.

He points out the fact that the platforms are now placed so as to leave a space of about two feet between them and the cars. Persons walking along the edge of these platforms are liable to slip and fall off under the cars, and be injured, and are sometimes crowded off in the rush for seats in trains.

He suggests that a uniform height for platforms in depots should be adopted, at least on the same road, and that perforated shield plates be attached to both sides of cars, extending laterally so as to reach over and a little beyond the edges of the platforms, and joining the steps of the cars in a proper manner. Also, that shield plates be placed between connected cars, to prevent passengers from falling between them; and that, also, a bridge with side railings should be placed between connected cars.

He further suggests that cars should always be coupled and uncoupled from above, instead of from the side as is usually the case, and thinks the details of these improvements will offer little difficulty to engineering skill, and entail very little additional cost upon railway companies.

THE BATTLE OF THE TIRES.

The question of rubber tires for traction engines is one now hotly disputed on the other side of the Atlantic. This is about how the matter now stands.

First, the advocates of the soft rubber tires claim that the experiments performed at Rochester, described in one of our late issues, were made in the interest of Aveling and Porter, and that they were not fair, as the proper proportions of the tires were not observed, as they are on the Thompson road steamer. Further, it is claimed, as proof that the manufacturers of the rigid tired wheels are really convinced of the value of the rubber tires, that Messrs. Aveling and Porter have purchased a license to use such tires from Mr. Thompson, the patentee. The first of these statements is replied to by a denial; and the second is answered by a statement of Messrs. Aveling and Porter that they do not avail themselves of their license to use rubber tires, because they are not yet convinced of their durability and efficiency.

A correspondent of the *Engineer*, writing from Glasgow, over the signature of "Old Traction Engine Driver," asks a series of questions, which, by implication, may be fairly translated into statements in regard to rubber tires, as follows:—A 6-foot Thompson's tire weighs 6 cwt., and costs 2*s.* a pound, or thereabouts. The tires of the Thomson engine, with their armor, cost £209—that is, about $1,050 in gold. He further states, by implication, that the rubber tires, when left to rest in a damp and warm atmosphere, spontaneously evolve the sulphur they contain, and decay, and that the use of the armor reduces the tractile power of the wheels, while to omit the armor insures the speedy destruction of the rubber tires. He adds that, in his opinion, Mr. Thomson's tire possesses certain advantages over ordinary iron tires, which, under most circumstances, are not worth the first cost of the rubber, even if the rubber could be got to last, say for three years, and under no circumstances are worth the first cost, seeing that the performance of the costly tires cannot be depended on for even a few months. He thinks that, in about a year, the present purchasers of Thomson's tires will be less pleased with them than they are now. The replacement of a new set of tires will be found a rather costly item in repairs.

We give these statements for what they are worth. They are not made in that spirit of candor which appeals to the inborn sense of truth; and yet they certainly represent an existing doubt whether the rubber tires do not cost more than they repay in practice.

There are so few of these engines in use in this country that we must rely, for the present at least, upon the facts received from foreign sources, in making up our judgment. The correspondent referred to assumes to speak from the card, and yet we feel that it would not be safe to found a judgment upon the statements he makes.

Per contra, we find a letter in *The Engineer*, in which the writer gives his experience as entirely favorable to the durability of the rubber tires, both with and without armor. He has found the breakages to be confined chiefly to shoe-plates and rivet links. He has worked the tire continuously from Sept. 20th to the date of his letter (March), without material reduction in its thickness through wear, and he ascribes the trouble hitherto met with in the use of these tires to the fact that, their proper consistency not being fully ascertained, some blunders were necessarily made in this particular. The tires described by this correspondent have, he says, drawn a load of from 13 to 14 tuns, gross; 260 journeys of 7 miles each (1,820 miles, up a gradient of 1 in 10, most of the way), with a consumption of coal averaging 700 lbs. per day, from 5 A. M. to 2:30 P. M. The external surfaces of the tires are, he states, only slightly marked, while the surface next the rim of the wheel is as smooth as when first put on.

The *Irish Farmers' Gazette*, of March 18th, contains an extract from the *Scotsman*, describing a very successful experiment with a Thompson road steamer made in Dunmore Park, on the estate of the Earl of Dunmore—this gentleman having invented an improvement on the shoes heretofore employed to prevent their slipping on wet grass. Lord Dunmore's invention consists in an addition of "clams" to the shoes surrounding the india-rubber tires, converting them, as it were, when the steamer is used in plowing, into hobnailed shoes.

The journal quoted, says:—"The field to be broken up had lain in pasture for 40 years, and had not been plowed since 1831. It was therefore extremely tough to work, and the ordeal was great both to the road steamer and the plow. It had also rained heavily all the morning and all the previous night and day; and as the field had never been drained, it afforded ample opportunity for the verification of the evil prophecies of those who had declared that no traction engine could drag itself, much less a plow, over such land. The engine, however, steamed down the field in the easiest and smoothest manner imaginable, and its work was admirable. The furrows, 6 inches by 10, were beautifully turned over, closely packed, giving a nice shoulder and a capital seed bed. Notwithstanding all the adverse circumstances, there was not a hitch but what would have occurred to an ordinary swing or double-furrow plow. Horses brought into the field in the morning sunk into the soil three inches."

The rapidity with which the work was performed, and the number of furrows simultaneously turned, are items not mentioned in the extract alluded to, so we can form no opinion upon the results of the experiments in these particulars.

The old proverb, "that there are two sides to every story," is singularly illustrated in this controversy. Time will be the arbiter of this, as of other questions of importance. The evidence is not all in yet.

EMPLOYMENT OF FEMALES IN NEW YORK.

The labor of women is largely employed in this city, the constant immigration keeping the market overstocked, and preventing anything like a rise in wages. Of 24,000 hands, distributed among the trades of bonnet-frame making, paper-box making, bookbinding, paper-collar making, shoe fitting, cap making, hotel and restaurant attending, artificial flower making, hair weaving, and lace sewing, we find that the earnings generally average about seven dollars per week, for work of ten hours per day. Putting such peculiar and limited trades as satchel sewing and type setting out of consideration, it must be admitted that the average wages paid to women are small, and that employers get full value for their money. A good shoe-fitter will earn $20 or $22 a week; a lace sewer almost as much; while the run of wages to women compositors is about 20 per cent below men's. A great many females are employed in tobacco stripping—work so simple that mere children can do it, and the pay is from $3 to $5 per week. The wages of paper-collar makers are no higher, and this large trade employs 4,000 hands in the city of New York.

The *Star*, to which we are indebted for some of the above figures, states that "no girl, who values her health, should work at folding and stitching."

The condition of many of these working girls is one of extreme hardship. Many are constantly out of employment, and when employed, their wages scarcely suffice to supply them with food, clothing, and lodging, even of the plainest kind. The benevolent and philanthropic are, however, endeavoring to ameliorate their condition, and it is to be hoped that a better day is dawning for women and girls obliged to support themselves by the labor of their hands.

SCIENTIFIC INTELLIGENCE.

FIVE MILLIARDS OF FRANCS.

The indemnity to be paid to Germany by France is said to be five milliards of francs, and as this sum exceeds the ordinary transactions of life so greatly as to be unintelligible, a German scholar has founded some calculations upon it for the edification of his countrymen. We give it for what it is worth. The weight of five milliards of francs, in gold twenty franc pieces, is 3,548,380 pounds, and it would require a train of 322 average freight cars to transport it. The same sum in silver five franc pieces would weigh 55,000,000 pounds. A practised teller can count out 40,000 francs an hour in five franc pieces; assuming that he were to begin his counting at 25 years of age, and to work steadily eight hours for 300 days in the year, he would not complete his task until he had passed his 77th birthday. If laid down in one franc pieces, so as to touch each other, the line would extend 71,461 miles, nearly one third of the distance from the earth to the moon. In gold twenty franc pieces, the line would be 3,262 miles long. Finally, if we call to mind that since the birth of Christ not one milliard of minutes has passed away, we can understand that, if for every minute, day and night, since the commencement of the Christian era, a five franc piece had been laid aside, we should not yet have extinguished the debt of France."

MANGANESE IN VEGETABLES.

It has generally been stated that manganese does not occur in vegetables, but recent researches go to show the error of this assertion. In examining beech wood which was grown on soil containing manganese, near the University of Göttingen, also near Geissen, too much manganese was found to be considered accidental. Finally, beech nuts from the famous park of Blenheim, in England, have been shown to contain manganese as a regular, fixed constituent. From these observations, it would appear that this metal is a constituent of a certain species of tree, and it is probable that it will be found in other varieties, if search be made for it. The question is interesting, from an agricultural point of view, and may lead to ingenious experiments.

EXAMINATION OF PHARMACEUTISTS.

We have been shown the examination papers of the recent graduates of the College of Pharmacy, in New York, and must say that we find the questions thorough and searching. Any student who could answer all of these questions must be regarded as fully entitled to a diploma from the trustees, and the compounding of medicines may be safely intrusted to his charge. We give below some of the questions, for our readers to try their hands at answering, selected at random from a long printed list:

What is glycerin, and how is it prepared?

How much iodine is required to prepare 2 drachms of iodide of iron?

What are the different kinds of fermentation and their products?

What is the best antidote in poisoning by arsenic, and how is it prepared extemporaneously?

Digitalis: Definition, natural order, habitat, medical properties, officinal preparation, doses.

Opium: Definition, natural order, commercial sorts, alkaloids, tests, symptoms of poisoning, antidotes, incompatibles, medical properties, names and strength of official preparations, and their doses.

What is the officinal name for calomel? preparation? common impurity? how detected?

What is the characteristic difference between decoctions and infusions?

What is pyroxylin? how prepared? properties and uses?

What are the equivalents of the kilogramme and gramme in grains, and what are the equivalents of the liter and cubic centimeter in grammes?

GAS FROM THE RESIDUUM OF PETROLEUM.

What to do with the heavy tar left in the retorts after the naphtha, kerosene, and other products have been distilled off, has occupied oil dealers ever since the introduction of petroleum as a burning fluid. A number of patents have been taken out, covering various uses, but the most valuable is probably the conversion of the residuum into illuminating gas. This is a vey simple and neat operation. It is only necessary to heat the oil in a suitable retort, pass it through a scrubber, and thence directly to a gas holder. As it has already been distilled at a high temperature, the lighter and more inflammable oils have been removed; and there is no sulphur or ammonia requiring expensive purifiers. The whole operation can be conducted as readily as the distillation of resin, and affords a gas so rich that ordinary burners cannot be used; but in their places, tips, consuming only one foot per hour are substituted. Gas from coal requires a five feet burner to produce the same illuminating effect as can be obtained from one foot of the gas from petroleum. A number of towns, large factories, schools, and private dwellings are lighted with this gas, and as the explosive mixtures are previously removed in the original refining of the crude petroleum, there is not the same danger as we have pointed out in the case of naphtha, gasoline, and air light. Where a sufficient supply of this residuum of stills can be had, it ought to afford a pure and cheap light.

A New Water Meter.

One of the most comprehensive and interesting papers on mechanical subjects which we have met with, is that of Mr. Fred. E. Bodkin, on "Water Meters," read before the Society of Arts, in London, Feb. 12th. It shows very thorough knowledge of the various principles employed in Europe to solve the very knotty problem of measuring, under pressure, the flow of water through pipes. In this paper the uses of water meters are succinctly set forth, and then the leading principles of construction of all the principal meters is described, their deficiencies and defects explained. The merits of a new invention in this line are emphatically extolled by Mr. Bodkin, who says:

A great step in the removal of the defects, both in this and every other meter yet introduced, is exemplified in an invention by Messrs. Cook and Watson, a meter which has only lately come before the public notice. It consists of an upper plate, indented on the under side with a ring of thumb holes, and riding loosely in a chamber over a lower plate, through which inclined inlet holes are bored. The water rises through these holes, raises the upper disc, and, acting against the square ends of the thumb holes, causes it to rotate at the same time. This action, of course, requires some small power to commence, but as soon as the upper plate is lifted it must also necessarily rotate. When the supply ceases the upper plate falls, and forms a tight valve against the return of the water; and since, during its period of revolution, this plate floats in a film of incoming water, there are no wearing surfaces involved in the machine. Small stays are placed on the upper surface of the revolving plate, in order to produce regularity of motion under varying pressures, and appear, from the specimens I have at different times been enabled to test, to do so with complete success.

These machines are not expensive, and offer but small opposition to the flow of liquid, and certainly appear to be the simplest and most practicable form of high-pressure meter yet invented.

The Chronopher.

"Greenwich time" is kept all over England and Scotland by all the railway, postoffice, church, and watchmakers' clocks. The time is sent daily, at 10 o'clock, from Greenwich Observatory, all traffic over telegraph wires used for the purpose being suspended at 9·58. Sixteen of the most important cities are in direct communication with Greenwich, and places through which the wires pass are aware of the completion of the circuit which announces 10·0 o'clock. The principal London watch and chronometer makers, such as Dent, Vulliamy, Barraud, Walker, Frodsham, and others, are communicated with even more frequently. Guns are fired at the ports of Newcastle and Shields at one o'clock daily by the same means. The clock at Greenwich, which automatically sends the time, is called a chronopher, and is corrected to a variation of a twentieth part of a second in a week.

This is an useful arrangement in England, where the country is so small that one uniform time can be kept without varying more than a few minutes from solar time, even in the most distant cities. But it could not be practiced in the United States. No assimilation over a part of the country would do anything but confuse and perplex the public; and if the clocks of San Francisco kept New York time, they would vary from solar time, by a difference of more than three hours.

A State Reward for Inventions.

The Legislature of New York has now before it a bill to encourage the invention or discovery of new and better methods of propelling canal boats. The bill offers *fifty thousand dollars reward* for the best plan, and has passed to its third reading in the Assembly. During the discussion, one of the most experienced and intelligent members spoke of the importance of this proposition to inventors. He knew the $50,000 would be a mere bagatelle to the real value of such an invention, but he was frank to say that he did not believe the State would soon be called upon to pay that $50,000. Such an invention would be worth millions of dollars, and whoever could produce what was wanted, ought to be paid $1,000,000, instead of $50,000.

Another member announced his willingness to vote for the bill, but at the same time, from what he had seen in the days of his youth, when passenger packets were on the canals, he did not believe the speed looked for could be secured without washing the banks of the canals.

We believe that some of our ingenious readers are competent to study out the solution of this problem, and we advise them to try. Unless an attempt is made, nothing will be accomplished. One of the good effects of the offering of specific rewards for special inventions is that careful study is induced, which leads to useful results, in some direction or other. Many unexpected and useful discoveries have thus been made.

Cutting Glass by the Blowpipe Flame.

At a recent meeting of the Albany Institute, a member exhibited specimens of glass cutting by the use of the blowpipe, which is specially adapted to cutting tubes of all sizes, thick or thin. A sample of a tube cut spirally in this manner has been sent us. The tube is about 1¼ inches in diameter, and is cut from end to end in a spiral, the cuttings not averaging more than ¼ inch in distance from each other. The cutting is done by directing the point of the blue flame against the side of the tube. Instantly, a small check or crack is formed, which may then be led in any direction by directing the point of flame to the part to be cut. In dividing thick and large tubes, it is advised to begin by separating them into large sections, and afterward subdividing these sections, till the required length is reached.

The Lenox Library.

The munificence of private citizens of the United States in their gifts for public purposes has often brought forth expressions of astonishment and admiration from European and other travelers who have paid us visits; and certainly the liberality of the donors, and their more rare and good judgment are matters of which we have right, as a nation, to be proud. Mr. James Lenox, a very worthy and wealthy citizen of New York, purchased a block of ground fronting on Fifth avenue, between Seventy-first and Seventy-second streets, and facing the Central Park; and arrangements have been consummated, and plans drawn, for the immediate erection of a library building, massive and solid in construction, and of grand and imposing proportions. Lockport limestone will be the material used, and the building will be fire-proof. The ground and building will cost, in all, about $1,000,000, and the work will be commenced at once.

TENNESSEE INDUSTRIAL EXPOSITION.—A grand industrial exposition of the mechanical, mineral, and manufactured productions and arts of Tennessee will be held at Nashville, May 8 to 27, 1871. Circulars containing rules and instructions, with full information, may be obtained by addressing Tennessee Industrial Exposition, Nashville, Tenn.

THE importance of cotton seed for oil manufacture is appreciated in England, the annual production of oil having reached 20,000 tuns.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

671.—HANDCUFF AND SHACKLE.—J. J. Tower, Brooklyn, N. Y. March 14, 1871.

675.—PRINTING MACHINE.—C. T. Bainbridge and R. P. Yorkston, New York city. March 14, 1871.

688.—REFINING AND PURIFYING CAST IRON.—James Henderson, New York city. March 15, 1871.

689.—PRINTER'S COPYING INK.—C. McIlvaine, Wm. McLloyd, and F. J. Firth, Philadelphia, Pa. March 15, 1871.

699.—FORMING ELBOWS AND BENDS IN METAL PIPE.—Charles Hoeller, Cincinnati, Ohio. March 16, 1871.

704.—COUPLINGS FOR HOSE AND OTHER PIPES.—P. Barnes, Jr., Troy, N. Y., now residing at 8 Southampton Buildings, in the county of Middlesex, Eng. March 16, 1871.

727.—DRIVING MECHANISM FOR SEWING MACHINE.—A. W. Harris, Providence, R. I. March 17, 1871.

737.—MACHINE FOR SPINNING, WINDING, AND DOUBLING FIBROUS MATERIAL.—George Draper and W. F. Draper, Hopedale, Mass. March 18, 1871.

740.—MANUFACTURE OF TEXTILE FABRICS.—George Merrill, New York city. March 18, 1871.

747.—NAIL-CUTTING MACHINE.—Oscar Mussman, New York city. March 20, 1871.

749.—FASTENING AND SUSPENDING WINDOW SASH.—P. W. Gates, Chicago, Ill. March 20, 1871.

755.—BREECH-LOADING FIREARM.—W. C. Dodge and P. T. Dodge, Washington, D.C. March 20, 1871.

Foreign Patents.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.]

1.—TURNING CURVED PLUNGER.—Will Mr. Patten tell us how he would finish the plunger, where the flange plate is attached to it?—S. G. S.

2.—ELECTRIC CURRENTS.—If, as is claimed by some, electricity does not consist of two currents in opposite directions, how is it that a card punctured by the passage of a discharge from a Leyden jar is equally burned upon both sides?—F. I.

3.—CEMENT FOR LEAKS IN GAS HOLDERS.—I wish a good cement for the above purpose. I have tried many recipes, but the oil from the gas either softens everything I have used, or the cements crack, when hard, from the working of the holder.—F.C.

4.—DIAMETER AND PITCH OF TOOTHED WHEELS.—Will some one give me a short and accurate way of determining the diameter of cog wheels, pitch and number of teeth being given; and, *vice versa*, to get the pitch, the diameter and number of teeth being given? I have the tables of given numbers, but these I do not happen to have with me at times—probably when most wanted. I know the rule: Set off 7 times the pitch on a straight line; divide same length into 11; each division equals 4 teeth on the radius; but this is incorrect in small wheels or pinions. Is there not some short and accurate rule that a man may think of at any moment, without tables, etc?—J. W.

5.—SHELLAC POLISHING.—How ought I to prepare shellac for polishing on a wheel?—J. L.

6.—ANNEALING STEEL.—What is the best way to anneal cast steel for filing or drilling, so as to remove the little "pins" appearing usually in steel, which a file will hardly touch?—F. A. K.

7.—PLASTER MOLDS.—What can I add to plaster of Paris, when mixing it for molds, that will enable it to withstand the action of water at 312° Fah?—G. M.

8.—POLISH FOR WOOD IN THE LATHE.—I wish a recipe for a transparent polish to be applied to wood, while in the lathe, after it is turned, and which requires a nice finish.—W. H. B.

9.—CASE-HARDENING IRON.—Will some expert in processes of this kind favor me with instructions how to harden iron in the various ways found valuable?—E. B. T.

10.—WHITE GLUE.—How is white glue made? Full details of the process are requested.—J. F. H.

11.—WANTED.—By that large class who are under the sad necessity of using crutches, some device to protect the clothing, around the arm, from the wear and tear consequent upon their friction.—CONSTANT READER.