NEW INVENTIONS.

An improved monkey-wrench has been patented by Mr. Allen K. Sheppard, of Camden, N. J. It consists of a wrench in which one jaw is attached to a shank that slides within a hollow handle to which the other jaw is fastened, the handle having a cam-dog that acts upon a block resting against the sliding shank, which, with its jaw, can be locked in any desired position or released by turning the cam-dog.

An improved air compressor and faucet has been patented by Mr. Samuel A. Livingston, of East New York, N. Y. The object of the invention is to aerate beer, as well as create a pressure by forcing air up through the liquid, and also to allow a keg to be tapped without permitting the natural gases of the liquid to escape.

A simple and convenient device for preventing a door from swinging back against the wall and for holding the door open, has been patented by Mr. John J. Schlueter, of San Francisco, Cal.

An anti-freezing closet has been patented by Mr. John B. Gordon, of Cutler, Ill. The object of this invention is to furnish anti-freezing closets so constructed as to prevent the freezing in the coldest weather of canned fruits, meats, and other articles, and thus preserve them in good condition.

An improvement in wash basins has been patented by Mr. Chas. E. Robinson, of New York City, N. Y. The invention relates more particularly to that class of basins known as the "Wellington," which consist of two concentric basins, the inner one of which overflows over its top edge into the outer one, both of which discharge through a central opening at the bottom into a circular trap suspended in a circular trap-chamber, which is detachably held to the bottom of the outer basin and coupled to the waste-pipe.

A French Photographic Salon.

A handsome salon on the first floor is a fitting reception room to the studio, which of late years has attained such high reputation, both in Paris and in Milan, as that of MM. Benque et Cie. Fluted columns, draped with rich maroon curtains, are at the entrance to this apartment, into which not a ray of direct sunlight enters. All is soft and somber within. There are extensive windows, but these are hidden by loosely festooned drab silk, so that while there is plenty of illumination, it is subdued and yet refulgent. The walls are of chocolate brown, the damask, chairs, and furniture gold and black, the fittings rich and handsome. This fine carbon portrait in frame complete, standing a meter high (39 inches), is a specialty of the firm Benque et Cie., and sells for a thousand francs. These pictures on the table are what is termed the "Paris portrait," similar in height to the panel or promenade, but half an inch broader, a very attractive size, but still, to our thinking, not so elegant in its proportions as the promenade. Of cabinets, there is also a collection, not large, for we believe that there are not more than a score of photographs in the whole salon. Two or three cartes are here also, but during the past three months, our host tells us, not a single carte picture has been taken in the establishment. Here, too, we find Madame Nilsson, not in a frame, but in the flesh; she is looking at some portraits of sister artistes, after undergoing a lengthened sitting. "We have just taken one hundred clichés," our friend whispers, "and within the space of an hour and a half."

Before we walk upstairs, we are presented with a card of terms. Here it is:

12 Cartes-de-visite, 30 francs; the dozen following, 20 francs; 12 cabinet portraits, 80 francs; 6 cabinet portraits, 50 francs; the dozen following, 60 francs; 12 Paris portraits, 120 francs; 6 Paris portraits, 80 francs; the dozen following, 100 francs.

In the Benque establishment, gelatine reigns supreme. "Do you develop at once, or in the evening?" we ask. "Always in the evening—we are now so confident of our results; of those hundred clichés just taken of Madame Nilsson, not one will be developed till to-night." The development is done by artificial light, by means of a gas-burner behind ruby glass, a convenient tap permitting the photographer to heighten and lower the jet at will. The developing, too, for the most part is done mechanically. As soon as some idea has been obtained of the exposure of the plate, and the time and strength of development, half a dozen clichés are put together into a rocking tray. The developer is poured over the films, and then the tray rocks to and fro by itself, kept in motion by a heavy pendulum that swings underneath. It saves a world of trouble, our host tells us, and produces very uniform results. We always like to take the sense of photographers on the development of dry plates, and we put the question whether pyrogallic or oxalate treatment is preferred. "*Oxalate toujours—Oxalate toujours*" is the energetic reply.

The studio is large and roomy—the largest in Paris, our friend says; at any rate, it measures fifteen meters (nearly fifty feet in length). There is nothing particular to be noted about the lighting; top-light is the dominant light. The walls are of very dark brown, and we remark upon this. They are dark, admits our host; but when they are again painted, we shall color them darker still. Large plates are in general use at the Benque establishment, and large cameras. As a rule, six poses are taken on one plate. We mentioned the other day the circumstance of Madame Judic being portrayed 132 times in this studio at one sitting. She was at the atelier for two hours only, and, during that time, changed her dress four times. Twenty-two poses were taken, of each six clichés, with an exposure of about three seconds. The negatives were developed at night, and there were only two technical failures. "Elle ne voyait plus," when she went away after the ordeal, our host remarked of the fair comedienne. Certainly, such rapid work could not have been undertaken before the days of gelatine. There is no dark room adjacent to the studio; the plates in their slides are sent up a shaft from the laboratory below, and delivered close to the assistant's hand in the studio, after the manner of Messrs. Window & Grove's studio, which we described the other day. The exposures are made by means of the ordinary pneumatic-Cadett shutter.

In the enlarging-room there is one point worthy of mention. The camera is disposed pretty well as usual; but just in front of the transparency is placed a swing looking-glass or mirror, perhaps twenty inches high. This permits, in a most convenient manner, the concentration upon the transparency of light that comes through a small opening in the wall, and if the mirror is turned to its proper angle by hand, the hand being never quite steady, no partial lighting is likely to ensue.

There are two printing rooms, and MM. Benque send the negatives to one or the other, according to their density. Thus in the top printing room, which is on the roof, the denser clichés are to be found, and those which will bear strong light; while in the more subdued light of the lower printing room are located such clichés as require more delicate treatment. From 1,200 to 2,000 prints are produced here every day, for the firm has now a large publishing connection, and their portraits go to every capital in Europe. Printing to this extent would be impossible in a London atmosphere, and for this reason our big metropolitan firms have usually an establishment in the suburbs for the purpose. But in Paris they burn charcoal more than they do coal, and, moreover, when this is used, it is of a much less sooty character than that employed in this country.

Starch, prepared fresh every day, is invariably employed for mounting at the Benque establishment; where so much publishing is done it is a matter of imperative necessity that the mounting should be depended upon, especially as black mounts are largely used just now. We are glad to hear, by the way, that of late these black mounts are more satisfactory than was the case a short time ago. Numerous cases of fading were then rife, and the cause, as our reader knows, Mr. Spiller was able to trace to the presence in the mount of a considerable quantity of sodium chloride, or common salt. The test to discover this—namely, the adding of a few drops of nitrate of silver solution to water in which one of these has been steeped for some hours, and observing whether any turbidity results—is so simple that any photographer can make use of it for himself.

Besides making itself known through its publications, the firm also adopts the practice of exhibiting its works largely in Paris. The Boissy d'Anglas, although a turning out of the Faubourg St. Honoré, is not a very frequented thoroughfare, and hence visitors to Paris might well escape seeing the studio. MM. Benque et Cie. have therefore opened an exhibition in the Rue Royale, that familiar street leading from the Madeleine to the Place de la Concorde, and here a display of the firm's finest work is exhibited. A *pièce de resistance* is always present in the form of a scene from one of the Paris plays. Whatever happens to be popular on the boards for the moment is here illustrated. The boat-scene from Michael Strogoff is the present attraction, a fine enlargement from nature, measuring perhaps three feet across, and including the portraits of half a dozen favorites. Any scene is chosen in which many characters are grouped, and the photograph being well executed, it naturally draws considerable attention. A magnificent portrait of Gounod, another of Judic, and a forcible picture of that Swedish professor with the hard name who discovered the North East passage, are also attractions at the little exhibition in the Rue Royale.—*Photographic News.*

Ventilating the St. Louis Tunnel.

The annual report of the St. Louis Bridge Company has the following in regard to the ventilation of the tunnel which forms part of the western approach to the bridge:

"The increasing number of trains passing through the tunnel has rendered its ventilation a serious question, as the peculiar arrangement of grades and lateral archways makes it almost impossible for natural ventilation to take place. For some months past it has been almost impossible to keep the track gangs long enough in the tunnel to properly repair the track; and, in addition, the great quantity of smoke pouring out of the openings at St. Charles and Second streets has caused us to be threatened with numerous damage suits on account of this nuisance. There remained, therefore, but one course to pursue, to put up a shaft and mechanical ventilator, to thoroughly exhaust the gases from the tunnel, and to discharge them at a sufficient height not to annoy the public.

"Col. C. Shaler Smith has devoted a great deal of time and attention to this problem, and the very ingenious plan devised by him is now in the course of being carried out. The requisite property has been condemned and acquired, and the iron for the chimney (which is of boiler plate, and will be 15 feet in diameter and 125 feet high), is now on the ground, and the erection has begun. A 120 horse power engine is under construction, and a pneumatic screw, having a capacity of 400,000 cubic feet of air per minute, will be placed in the base of the shaft and worked by this engine. To enable the repair gangs to work continuously in the tunnel, and to silence the complaints made as to the smoke at Main and Second street bridges, a small air screw on the same principle as the large one has been put up at the St. Charles street opening, and is now exhausting the gases at the rate of 30,000 cubic feet per minute. The effect of this small model, which is only 4 feet in diameter, leaves no doubt as to the success of the large screw when it shall be placed in position. Room is being prepared in the engine house for a 16-light electric machine, should it be considered advisable to light the tunnel in this manner. No extra power will be needed, as the engine ordered will be of sufficient capacity for both fan and electric light."

A Railway Tunnel through a Volcano.

The rocks which constitute the southern island of New Zealand are for the greatest part of the archaic type, consisting principally of gneiss, granite, mica-schist, phyllite, quartzite, and felsitic rocks. They are partly covered by palæozoic strata, which are folded up into innumerable troughs and saddle-backs throughout the province of Canterbury, and which partly belong to the carboniferous period, so that there are prospects for a future discovery of coal beds. By far the greatest interest, however, is offered by the extensive volcanic phenomena of the island, and among them the extinct volcanoes upon the Banks peninsula, east of the town of Christchurch, are prominent. This peninsula, now only connected by bands of low and recent deposits with the mainland, was once a complete island, only formed by volcanoes, which rose up from the bottom of the sea. The special construction of such an extinct volcano has been made visible by a tunnel of 2,620 meters' length upon the railway between Christchurch and Littleton, which has pierced through the walls of a volcanic cone and thus has laid bare its structure of successive streams of lava and beds of scoriæ, ashes, and tufæ, which are again intersected by dikes of younger volcanic rocks. This is perhaps the first volcano through which a railway has been constructed.

Another peculiarity of New Zealand is the extremely frequent occurrence of bones of those large wingless birds, which by the aborigines were called "moa," and which belong to the family of the Dinornithidæ, of whom the largest representative, *Dinornis maximus*, has reached the considerable height of ten and a half feet; the largest deposits of these bones were found in the Point cavern and the marshes of Grenmark. There is now do doubt that these gigantic birds were contemporaneous with man, and that an early human race were moa hunters in these islands, who lived upon the flesh of these birds at a time when the glaciers extended still very much below their present boundaries, for bones, tools, and other remnants of these early moa hunters are frequently met intermingled with bones of the now extinct Dinornithidæ.

Earthworms and Anthrax.

An important report was presented to the Académie de Médecine, at its meeting on the 17th inst., by M. Villemin, in the name of a commission appointed to investigate the statements of M. Pasteur as to the presence of the germs of anthrax-bacteria in the soil, and their transportation by earthworms, statements which had been contradicted by M. Colin, of Alfort. In the investigations of the commission they first inoculated five guinea pigs with earth taken from the soil over a trench in which animals dead of anthrax had been buried twelve years previously. All the guinea pigs died, the first four from septicæmia, the fifth from well marked anthrax, and the latter presented numerous bacteria in the blood of the heart and the spleen, which organ was considerably enlarged.

A second similar series of guinea pigs were inoculated with earth from above a pit in which animals dead of the disease had been buried for three years. The first four of these also died of septicæmia, and the fifth of anthrax, with characteristic bacteria. A third series were inoculated with "virgin soil"—*i. e.*, earth from a spot in which, "within living memory," no animal dead of anthrax had been buried. All of these continued well, presenting only at the point of the inoculation a small nodosity the size of a nut, and consisting of an abscess inclosed in a pyogenic membrane. The first two of these experiments with the suspected earth were repeated, six guinea pigs in all being inoculated. Of these all died, five of septicæmia, the sixth of anthrax. Two other guinea pigs were inoculated with blood from the animals to which anthrax had been communicated in the first two series of experiments, and both died of the same disease. A drop of blood taken from the ear of one and "sown" in some decoction of fowl, reproduced pure and abundant anthrax-bacteridia.

Some worms were also taken from the earth over the pits in which the animals had been buried three and twelve years before, and their excrement (the worms being still alive) was diluted with a little distilled water, and with it three guinea pigs were inoculated. Of these two died from septicæmia, and the third from anthrax. Other three guinea pigs were inoculated with the excrement of worms taken from soil beneath which, during the Commune, human bodies had been interred. One of the guinea pigs died from septicæmia, the other two continued well. Lastly, the excrement of worms collected over the trench in which the animals had been buried for twelve years, and treated by "cultivation," gave rise to a rapid production of bacteridia, which, inoculated into two guinea pigs, caused the death of both by anthrax. The experiments and report thus give a triumphant corroboration to the assertions of M. Pasteur.—*Lancet.*

Compressed Gun Cotton.

BY M. EISSLER.

Through the systematic study of Abel, an eminent chemist, this material has now attained quite a position in England, as by means of his analytical and synthetical researches he has found the causes of the instability observed in that substance, and has traced its occasional liability to undergo spontaneous combustion to the presence of minute quantities of foreign substances of comparatively unstable character, produced by the action of nitric acid upon resinous or fatty substances retained by the cotton fibers.

Some parts of his mode of manufacture may be considered comparatively safe, as he carries it on with the material in a wet, therefore uninflammable state. His mode of converting it into a minute state of division is the main improvement which he introduced, as it allows of a more perfect cleansing, and then its conversion into highly compressed masses is the main feature of his mechanical modifications; otherwise, he admits, one has only to follow Von Lenk's plan, and adhere to his rules.

The process of manufacture, as pursued by Prentice & Co. or the Liverpool Cotton Company, is as follows:

Clean cotton, picked as free as possible from foreign matter, is brought into a uniform and open condition, by being passed through a carding engine.

The rolls thus obtained are dried in a triple cylinder, by means of a steam jacket.

When completely dried it is placed in large tins and carefully covered.

After standing in these till quite cold, the cotton is weighed out in quantities of 1 pound each, and carried by a boy to the dipping vessel. Here each pan is charged with about 12 gallons of a mixture of 3 volumes of sulphuric acid, 1·84 specific gravity, and 1 volume of the strongest nitric acid, the whole being kept cool during the action by currents of cold water, which circulate around the vessel.

In this mixture the cotton is dipped, and after it has been in about three minutes the workman lifts it on to a grating, just above the acids. Then, with a movable lever, he gently squeezes it until, roughly speaking, it retains about ten times its weight of the liquid.

Thus saturated with the acids, it is allowed to remain in well-covered earthenware pots for twenty-four hours, the pots during this time standing in a shallow trough containing water to keep down the temperature, sufficient acid being added to cover the cotton. The chemical change in the cotton is now complete, and the further processes are for washing and pressing.

First, the large excess of acid is driven off by a centrifugal machine, and the waste acid is caught by a jacket surrounding the revolving portion of the machine, and collected in a receiver. These machines are on the principle of the wringing machines employed by laundries to dry clothes (whizzer).

On leaving the centrifugal machine the gun cotton has to be washed. This operation also requires great care, because the acids which the gun cotton yet retains would give rise to a considerable development of heat if mixed slowly with water. At such an increased temperature the gun cotton would be decomposed, or "fired," as it is technically called. Therefore it has to be brought at once in contact with a large body of water.

To perfect the washing, the cotton is subjected to the action of water for one, two, or three weeks, and afterward boiled in large vats by the injection of steam. By this latter operation the less stable compounds are destroyed and extracted, and the purified gun cotton is transferred to the heating tanks

This is a simple contrivance for converting the gun cotton into pulp. It is a machine similar to the one used in paper mills and called Hollander.

The pulp is now removed from the tank to a poacher, where it is agitated with a large quantity of water by a wheel, and here it has to be washed till it answers the heat test, which the chemist now applies.

When his report is favorable, the pulp is transferred to a vat and mixed with a small quantity of caustic soda.

The further processes of abstracting the water and moulding the pulp into cartridges or other shapes, is performed by hydraulic pressure or other pressing machines, which are very ingeniously arranged, and great credit is due to the manufacturers for the nice and elaborate machinery they have adopted for the treatment of their products.

Where the cartridges are made under light pressure they are put on perforated trays, and dried in chambers heated with hot air.

In establishments where the gun cotton is mixed with oxidizing salts, these are mixed in regular gunpowder incorporating mills, of light but very elegant pattern.

The great difference between the process of manufacture described above and that of Von Lenk consists in the introduction of the pulping operation devised by Abel. This improvement admits of very searching purification, and also of more reliable testing, and of the subsequent compression.

PROPERTIES.

Before it has been reduced to pulp, gun cotton has the same appearance as the original fiber, but it is harder to the touch; it has neither taste nor smell.

It is insoluble in water, ether, or alcohol. Dilute acids and alkalies have no action upon it, but a lower substitution product is formed by the action of nitric acid of the specific gravity, 1 45.

Strong sulphuric acid dissolves it with difficulty.

Caustic potash dissolves it.

Much uncertainty prevailed for a long time as to whether gun cotton was liable to spontaneous combustion or not. As I have shown in my former articles, it had been used in Austria for twelve years, where it underwent the severest tests, and was held by the best authorities to be perfectly safe, but it was at last rejected on account of its instability, and also that other governments abandoned it after experimenting with it extensively. Prof. Abel, in his valuable researches, ascribes the reason of its decomposition to be mainly due to impurity, generally resulting in the process of manufacture, from the action of the acids on resinous matter in the imperfectly washed cotton, and certainly the experience of the last few years speaks in favor of his theory, as no accidents from that score are on hand.

It is only in late years that the true cause of chemical instability, which belongs to the whole class of nitrated organic compounds, has been clearly defined, it being the life question of our modern high explosives.

After their nitration a certain portion of acid—sulphuric, nitric, and hyponitric—always adheres to those compounds, more or less, according to their form and structure. From a liquid explosive substance like nitro-glycerine, the acids are easily washed out by churning it with water first and then with alkaline solution. But a granular, flocky, or fibrous material, like cotton, retains the acids with far greater tenacity, particularly the nitrous and hyponitric acids, which every nitrated organic compound has a strong tendency to retain.

It is quite clear that if there is hyponitric acid present, that highly corrosive material, which attacks almost every organic compound, even at the ordinary temperature, must be removed; if not, it will slowly but surely lead to an incipient decomposition, which, acting on a nitrated substance, sets free portions of dioxide of nitrogen or hyponitric acid.

From nitro-glycerine the corrosive acid is washed out with the utmost facility, and from the moment when the importance of that operation became fully appreciated it has never been neglected. Hence the chemical stability exhibited by dynamite under all conditions of climate.

Although nitro-glycerine has exhibited, upon the whole, greater chemical stability than gun cotton, yet it acquires that superiority only after being thoroughly purified from acid at the factory. When it contains free hyponitric acid it cannot be stored at all in hot weather, and even during the course of its manufacture it has several times given rise to a decomposition, ending with explosion and loss of life. The instability of the crude article contrasts so strongly with the stability of the pure nitro-glycerine in dynamite as to remove every trace of doubt regarding the decomposing influences of the adhering acids.

FUMES.

Among the most grievous complaints of miners about modern explosives is the poisonous nature of the fumes emitted, which exposes them to most serious inconveniences.

The gaseous products of the explosion of gun cotton differ from those of nitro-glycerine, as gun cotton lacks 24·24 parts of oxygen in 100 for the complete conversion of its carbon into carbonic acid, consequently we have the following to be the percentage composition of the resulting gases:

Carbonic oxide	28·55
Carbonic acid	19·11
Marsh gas	11·17
Nitric oxide	8·83
Nitrogen	8·56
Aqueous vapors	21·93
Total	98·15

The large amount of carbonic oxide is very deleterious and even dangerous when pure gun cotton is exploded in a close place.

It is very clear to my mind why English manufacturers have adopted the admixture of oxidizing salts (saltpeter, nitrate of baryta) with gun cotton, as the oxygen contained in the salts effects a more complete combustion, rendering the resulting gases less obnoxious than those resulting from pure gun cotton.

GUN COTTON IN MINING OPERATIONS.

In the compressed form gun cotton is susceptible, like nitro-glycerine and its preparations, of explosion through the agency of an initiative detonation (cap). Compressed gun cotton may therefore be applied with the same facility as dynamite and analogous substances in all mining and blasting work. On a whole the mixture of gun cotton and salts is not as sensitive to concussion as dynamite, consequently an extra strong cap is required to detonate it. As the highest nitrated product of cellulose (trinitro) still demands 24·24 parts of oxygen for the conversion into carbonic acid of the carbon in 100 parts, it is evident that the most explosive gun cotton producible must be inferior in explosive power to nitro-glycerine, which contains a very slight excess of oxygen. Some authorities claim that, in spite of its high state of compression to which English manufacturers have brought it, its strength is much less than dynamite.

Here, also, it is clear why the English manufacturers have adopted the use of an admixture of oxidizing salts, as stated before; but the question will present itself: Is not the quickness of the explosion less rapid through this admixture than of pure cotton?

Where great local action is required, nitro-glycerine or dynamite competes advantageously with those substances. Some careful comparative experiments made by the German engineer corps, at Graudentz, with Nobel's dynamite and Abel's compressed gun cotton (made at the English government works), demonstrated that dynamite produced somewhat greater local or shattering effects than gun cotton.

The plastic condition of dynamite and similar preparations gives them an advantage over the rigid, compressed gun cotton in blasting operations, as plastic powders may be inserted more readily into rugged and uneven bore-holes, and may be made, by application of pressure, thoroughly to fill the part charged. Every miner is aware of the importance of having his charge well home in the bottom of his hole, filling the whole cavity. And this can only be accomplished with a plastic powder.

The increased effect derived from this mode of applying plastic explosives is far greater than is generally believed.

Volume for volume, it is impossible to put the same weight in a bore-hole for a certain given space; or, in other words, if one has a cartridge of dynamite, say one inch diameter and four inches long, and one of compressed gun cotton of the same size, the dynamite cartridge will weigh more; consequently one has more explosive material in the same space, owing to the higher specific gravity of dynamite, and as a consequence larger bore-holes are required when using gun-cotton, which increases the cost of mining.

The cartridges of compressed gun cotton are rigid, stiff, and every miner knows there should be no air chamber round the charge, for the expansion which it causes not only lessens the power in proportion to its dilution, but actually decreases the tension of the gas in a much greater measure. Stiff cartridges cannot be introduced into a bore-hole without leaving a considerable air chamber round the charge, particularly as bore-holes generally deviate a great deal from the circular shape.

It is difficult to calculate even approximately the relative proportions of the unoccupied space and the charge, but certainly the loss will amount to considerable. When a loose mass of gun cotton is ignited in the air it burns rapidly away without any explosive effect. But if the ignition takes place in a closed chamber, the gases first produced immediately penetrate the mass of the cotton, and the whole is instantaneously decomposed. According to some authorities gun cotton will not explode below a temperature of 280° Fah.

Gun cotton has the great advantage over dynamite that it does not freeze, and therefore needs no thawing out, which is appreciated in cold climates. It does not suffer from exudation, and when properly made has good keeping qualities.

One great advantage again of nitro-glycerine and its preparations is that they remain unaltered under water, and can be used in wet bore-holes with the same facility as in dry holes, and although compressed gun cotton, when containing 10 per cent or 15 per cent of water, can be exploded, it requires a very strong exploder or a dry primer to accomplish it, consequently for work under water dynamite is preferred.

The cost of these two materials also differs greatly; the expense of producing gun cotton must be 20 per cent or 25 per cent higher than dynamite; therefore, when the question of competition arises, the latter has the advantage.

In the last six or seven years there have been brought forward in England (since Abel perfected his system of reducing gun cotton to a fine state of division and compressing it) several special preparations of gun cotton, for which peculiar merits are claimed by their advocates. One of those preparations, manufactured by the Gun Cotton Company, is a mixture of finely divided gun cotton and saltpeter. Another, the Tonite Company, at Faversham, mixes gun cotton with nitrate of baryta. Which of these is the best practical experience alone can form the estimate.—*Mining and Scientific Press.*

ENGINEERING INVENTIONS.

An improved bridge has been patented by Mr. August W. Brenner, of Coleman, Texas. The object of this invention is to construct substantial bridges of wood adapted for long spans, and which can be put up where iron bridges would be too expensive. The invention consists in a bridge composed of arches having a central trussed portion, and ends formed as trusses that support the central portion and sustain the end thrust.

An improvement in ore washers has been patented by Mr. Burrall A. Peirce, of Mouth of Wilson, Va. The invention consists in combining guides and swinging shovels on the ends of blades, the latter arranged on the rotary shaft of an ore washer.

TEN years ago a blast furnace which would make 400 tons of metal per week on 600 tons of fuel was considered a big thing. We have blast furnaces in Pittsburg which produce 1,500 tons of metal per week on less than 1,500 tons of fuel. The old method of heating permitted the flame to pass out of the furnace stack at a temperature of 3000° F. We are now using the regenerating stoves in Pittsburg, and do not let the gases out until we have utilized all the heat except 300°.

THE International Geographical Institute of Berne has put forward a project for the establishment of an international school for training travelers. The programme of study is a formidable one, and is divided into two distinct divisions. The first includes instruction in numerous branches of knowledge more or less necessary for a traveler, and the second practical training in the field.