RIVER COURSES—CANALS—OIL VEINS.

[For the Scientific American]

In a previous article on the oil regions of Pennsylvania, the position was taken that the rivers and creeks had dug their own channels to the depths at which they are now found below the general table lands above, instead of the latter having been individually upheaved, as most persons appear to believe. After having formed this theory by a personal examination of the country, it was some satisfaction to the writer to find this view sustained by such an authority as Professor W. D. Rogers, in his geological report on that State. "The Alleghany River," he observes, "flows through a deep and narrow trench, excavated in the north-western plateau and western coal basin of the State, entering the north-west margin of the coal basin at Warren." Again: "It is evident that while the main discharge of the eroding wave was south-westward, one large influx of eroding waters swept north-westward of the Appalachian Mountains, and another south-eastward from the regions of the lakes." It is to these several agencies that he attributes the remarkable course of that river—now northward into New York, next south-west, then south-east, and finally south-west to Pittsburgh, beyond which the Ohio proceeds north-west, and then westward, before passing out of Pennsylvania. Yet on all this distance the river has never been once deflected from its course by what can be styled a chain of mountains; and the hills are nothing but bluffs through which it has excavated its own channel.

That the entire oil regions, in common with the great Mississippi basin, were upheaved from the ocean bed is a point which admits of no reasonable doubt. As the several layers of sedimentary rocks composing it (nearly all which are absent in New England and Eastern New York and New Jersey) were formed, the sea would appear to have gradually kept sinking to enable the masses of sand to become sand-stone rocks, clays to become shales, peat bogs and forests to become coal beds, gravel beds to become conglomerates, etc. This done, each layer having received its own collections of plants and marine or fresh-water shell-fishes, as the case might be, the whole country was gradually and gently upheaved to its present elevation, the operation being so easy as scarcely to disturb the beds of rocks composing the different strata of the Great West. Traveling along the lines of the Erie and the Pennsylvania Central Railroads, one may observe, on approaching the Alleghanies, synclinal and anti-clinal beds of perhaps ten miles in width, and in places twenty degrees from the horizontal; but along the Alleghany and the Ohio the dip is scarcely perceptible—seldom as much as three or four degrees. The lines of sand-stone and shale are arranged as regularly as the leaves of a book. In the course of more than two hundred miles' travel on foot through the oil region of Pennsylvania, the writer has not been able to observe one violent dislocation in the rocks beyond that produced by huge masses sliding from the summits. He was told, indeed, that such irregularities existed, but failed to find an example. Perhaps to the exception stated should be added the contortions made in the soft shale by huge trees, now petrified, around whose stems of thirty or forty inches diameter the clay had been bent and twisted, so that the horizontal lines were broken.

Before discussing the practical bearings of this subject, it may be proper to explain another feature in the physical formation of the valleys of the Alleghany, Oil Creek, French Creek, etc. In traversing their tortuous courses, which are often loops rather than mere bends, the visitor will observe that the bluffs opposite each convexity are high and precipitous, while the headlands embraced within the curve or concave side of the river slope gradually and gently down to its margin. Illustrations of this may be found every mile or two, and the rule may be set down as general, if not universal. The explanation of that phenomenon is manifestly this: Like every other substance, water has a tendency to move in straight lines. The slight undulations originally existing on the surface of the plateau, together with the agencies alluded to by Professor Rogers, caused the currents to bend this way and that, instead of pursuing a direct course. As the waters were deflected by one elevation, they turned off at an angle, and struck against the next opposing hight, undermining it more or less, and causing its upper series of rocks or clays to fall down to the river bed, in which they were gradually dissolved or ground together and carried away. Thus it came to pass that a double action was carried on during the thousands of years or of centuries in which these water-courses were forming. The first was downward, its action gradually decreasing as the channel approached the sea level; the second was outward at the several curves in its course, by striking against the elevated lands, which gradually became bluffs and precipices, in many cases too steep for human foot to climb without the assistance of the hands.

This centrifugal action of the waters, as it may be termed, has kept on for ages, actually increasing the length of the rivers and creeks, whose deep channels invariably lie as close on the outsides of the several curves as the masses of falling debris will permit. Boatmen and raftsmen understand this "law" thoroughly, though failing to comprehend its *rationale*. For in seeking the deepest channel downward or a shallower channel with little current upward, they steer for the concave or convex shore, as the case may be. Travelers on the Potomac, the James, or other rivers in alluvial countries. will have observed that the boat makes no short cuts at bends, having to stand out well from the shallows lying opposite to the various headlands. On the Alleghany these headlands are usually cultivated—in fact, they are the only cultivated soils on the slopes. In some cases, as at Tidioute, villages have been built upon these gentle inclinations.

Now for some of the practical lessons deducible from this explanation of the river-courses of the West. Major-General Butler undertook to force the James into a new channel at Dutch Gap, as Major-General Grant had undertaken with the Mississippi at Vicksburg. Both failed. The current refused to forsake its round-about course and seek the bed of the cut-off, or adopt any other "modern improvement." The trouble lay here: In both cases the river coming down by a pretty straight line struck a bluff a short distance above the upper end of the proposed canal. There the stream was deflected from its course, and struck off at nearly a right angle—one in the direction of another bluff (undermined) known as the Howlett House, the other against that on which Vicksburg stands (also undermined). Had the artificial channels been constructed further inland, or been so bent that their upper termini would have set up against the current of the river, as it struck off toward the opposite shore, there can be no doubt that both projects would have proved successful. In the case of the Dutch Gap work, if it had been located only two hundred yards nearer Bermuda, or if, instead of a straight course, it had adopted the serpentine, its northern entrance opening to receive the waters as they struck the bluff, the James would have rushed through it, and in the course of a few hours removed all obstructions. Yet the possibility of failure, from the cause stated, would seem never to have entered the head of military officer or civil engineer. Neither had studied the philosophy of water-courses.

Once more: There is an impression among men engaged in the oil regions, though not so strong as formerly, that river beds, headlands, bluffs, and table-lands, as such, have something to do with the discovery of oil; that, aside from the veins known to exist beneath the surface, one is more likely to succeed on the east than on the west side; close to the bluffs rather than by the streams; on the bottoms rather than on the plateaus. This is all moonshine. The first discoveries were made in bottom-lands, simply because the oil of the first sand-rocks could more easily force itself to the surface in the valleys than on the hights. As to any other distribution, it is absurd to expect it. At so much greater outlay for drilling, in the first place, and working the machinery afterward, together with the greater risk to seed-bags, tubes, pump fixtures, etc., oil can be obtained as readily on the hights as in the hollows, provided the oil veins are struck. That these are distributed pretty equally throughout what is known as the oil basin, without any reference whatever to upland or lowland, is manifest to all who have studied the physical formation of the country. In the writer's judgment, they have no connection or relation whatever to the coal-beds, which are many hundreds of feet higher geologically; while the structure of the rocks is such that it were impossible for oil, salt water and gas to have percolated downward through one thousand feet of solid rock—a depth to which fresh water is never found to penetrate without artificial channels. If we could even suppose that the oil had first worked its way downward, the gas being formed subsequently, an answer can readily be found in the fact that in the process of distillation the salt water would have become decomposed, and carbonic acid gas, instead of carbureted hydrogen, been evolved from the combination. If there is one truth more than another evident from the oil discoveries, it is that petroleum is as much an older formation than coal as coal is older than wood or peat. To comprehend it aright, we must study it from this point of view.

Correspondence

The Harrison Steam Boiler.

MESSRS. EDITORS:—Referring to your remarks on the Harrison steam boiler, published in your number of April 29th, I wish to say a word in regard to the *strength* of this boiler. In making many experiments to test the bursting strength of the spheres under hydraulic pressure, no sound casting ever gave way under *fifteen hundred pounds* to the square inch; it was not unusual for them to resist *two thousand pounds*, and this, too, when made of iron of no greater strength than the best brands of Scotch pig metal In a practical experience of several years with boilers varying from 5 to 200 horse power, explosions have never happened under any circumstances. Extreme pressure will open its joints before any thing gives way, thus making each joint a safety valve. A cracked sphere may produce a leak, but a boiler under pressure has never been suddenly emptied from such a cause. Instances have once or twice occurred where a cracked sphere has been continued for some time after the fracture was discovered, with no troublesome consequences from the leakage, and no necessity for instant repairs.

There have been but four fractures of spheres in all the boilers mentioned in the advertisement now in your journal, and in every case these could be fairly traced to special causes not connected with pressure. In my experience with this boiler, several have been *burnt*, or, in other words, rendered unfit for service for the moment by overheating after the water had fallen too low. The result in such case is obvious; spheres with no water inside and intense heat outside, are soon heated to redness and warped so much that the integrity of the joints is destroyed, causing the boiler at the injured parts to leak badly, but nothing like an explosion occurs. With great facility and little cost of time or money, the injured parts, in such a case, can be taken out and replaced by new ones, without even the use of highly-skilled workmen, after which the boiler is as good as before the accident. Some of these boilers are working daily at 180 pounds pressure to the square inch; and a good evidence of their value is shown in the fact that several parties, who have used the boiler longest in this country, have already in use, or have sent me orders for, a second one.

With this boiler on our Western steamboats, to which it can be easily adapted, such wholesale destruction of human life as took place on the *Sultana* a few days ago, *cannot possibly occur*.

JOSEPH HARRISON, JR., patentee.

Philadelphia, Pa., May 2, 1865.

Saleratus and the Teeth.

MESSRS. EDITORS:—The ground taken by a recent writer in your journal is not well founded. He asserts that saleratus or soda will dissolve the teeth or render them carious. His experiments do not prove it, though his deductions are true to a certain extent. It is true that a strong alkali will dissolve, or has affinity for, the lower part or root of the tooth, for this part of the tooth, together with lime, is composed of gelatine and albumen, which an alkali will dissolve. But the enamel is composed almost entirely of

phosphate of lime, with a small portion of earthy matter; therefore I cannot see how he can support his assertions, notwithstanding his experiments. I am satisfied, from a long study of the nature of the teeth, that acid is the only antagonist with which the teeth has to contend. The teeth are never injured by an alkali, except it comes in contact with the lower part (the roots) of the teeth—that part of the tooth usually covered by the gum; and until chemical affinities are changed I cannot be made to believe that an alkali will injure the crown, or that part of the tooth covered by enamel. No sensation is felt by the teeth coming in contact with the strongest alkali, but we receive warning of the injurious effects of acid, however weak, by setting the teeth on edge and producing tenderness.

H. E. SCHOONMAKER, Dentist.

New York, May 1, 1865.

The Best Detergent.

MESSRS. EDITORS:—There is a "washing compound" sold about the country here in which I have invested to the extent of a family right. I want to inquire of you if the component parts are injurious to clothes. It is made of sal soda, borax and lime. Having read the SCIENTIFIC AMERICAN for fourteen years past, I feel that I may be privileged to ask a question. W. C. A.

St. Louis, April 15, 1865.

[Sal soda is the carbonate of soda, and if dissolved and brought in contact with lime, it is decomposed, giving up its carbonic acid to the lime, and leaving caustic soda in solution. Soda has a powerful affinity for grease, and will remove it from cloth, but a strong solution of soda is injurious both to the cloth and to the hands. Borax is a detergent, and therefore would not be wholly useless in this mixture. The best material to be used, however, in washing is good soap. It will remove grease almost as well as caustic soda, it is the best general detergent known, and it is perfectly harmless to the cloth or hands. For full directions for making soap cheaply, see page 183 of our current volume.—EDS.

The Manufacture of French Leather.

The process employed for the tanning of cow hides is similar to that employed in the manufacture of sole leather. Instead, however, of sweating it, hot ashes are rubbed over it, but the mode in which it is prepared in France gives it a far different and better appearance. After the hides have been placed into bark three times, take them out of the vat, cut them with a knife into two parts, from the tail to the head and mark each side at the tail so that they may be easily put together again. Then rinse them in water, spread them on a tree, and strike them out with a blunt iron. If they are not previously well scrubbed, so as to be thoroughly clean, they are at this stage spread on a large tree, and over another hide, and then well grooved with a groove of fish bone. Then spread the halves on a board, with the grain upwards, and grease them slightly with pure terai oil, or linseed oil mixed with a small quantity of tallow. Then hang them across poles, with the grain still upwards, and let them dry thoroughly. After they have become perfectly dry, put them into a tub, and cover them all over with clean spring water. In about an hour take them out for awhile, and then put them in again to remain there over night. They are then taken and rolled upon a strong piece of wood, beginning the rolling from the tail, with the grain inside. By this process of rolling, the claws are all beaten in. Each half makes one roll, which is strongly tied up at both ends. The rolls are now beaten with notched sticks till they attain a very soft touch. In order to perfect the softening, and at the same time to separate the attached bark fluid, crisp well with a piece of wood, and then spread them flat. It is as well to have two persons engaged in this work at the same time, as also in the operation which follows. Now lay each half on a inclined plane, either of wood or marble, which must correspond in length to the whole hide and in width to the half. At first the grain side is put downwards. Have a pail of water near at hand, in which repeatedly dip a scrubbing brush, and rub it until the flesh is quite soft, so that when touched with the finger the mark is quite visible. Then turn the hide with the flesh side to the board, adjusting the back exactly to the edge of the board; press it over with the hand to make it stick to the board, and then rub it with the brush as before. It is now slightly smoothed over with a smoothing iron, in order that formed folds may not remain permanent. First, the back is smoothed, then the down part of the claws. After the folds are perfectly removed, the pressure may be applied with greater force for the removal of the bark pits.

As soon as one-half is smoothed, hang it in the drying loft, and if it is so high as to admit its hanging lengthwise without touching the floor, nail the claws and tail to short, strong pieces of wood, or make slits and put the sticks through, and fix them between two strong poles. But if the loft is low-roofed, then nail the back part to straight, strong poles, hang the poles up, and bind up with strings the tail and claws, so that they cannot hang down and form folds. Should the hides be too much withered by the air, then put each of them on the board, wetting the withered places well upon both sides. Do the same with the other hides, and lay them one upon the other, and pack them all together for a while. Then take the one first wetted again on the board; put the back part upon the edge, and fasten in with some wooden braces. These must be removed after a short time. The hollows caused by the bark and the deposits within them are now pressed out, and the hide is rubbed over with a damp woolen rag, and is again hung up. Before they are completely dry, fit the two halves together, and place them one upon the other, grain to grain, flesh to flesh, till they have formed a pile. Then put some planks upon the top, and a weight. Leave them for 12 hours, and then hang them on poles, cross-ways, till they are dry. After that they may be rolled up, each by itself, or five together, and then bound up with strings.

It must be observed that all the above work must be carefully performed, with the utmost regard to cleanliness. Leather manufactured as above answers all requirements, and in beauty and quality surpasses the Frankfort leather. The French term it *vachen* leather.

Reduction of Government Expenses.

The Government is proceeding vigorously in the work of retrenchment. A number of ships hired on contract have been discharged in Washington, Philadelphia and New York. A large number of sailors have also been discharged. At the Springfield (Mass.) Armory orders have been received by Major Laidly announcing that the daily product of the armory would within ten days or two weeks be decreased to two hundred and fifty guns, thus necessitating the discharge of about nine hundred more men. This will leave between nine and ten hundred, or only one third the number employed when the armory was busiest and turning out nearly or quite one thousand guns per day. No machinists will be discharged, as they will soon be needed on the preparations for the new breech-loader. The fortnight's notice is given the men so that they can have an opportunity to obtain work elsewhere, and all who can are advised by Major Laidly to do so. No further diminution of the working force is apprehended for the present, at least. All the men previously discharged but not fully paid, will be paid to-day up to the day of leaving, as the long-expected funds have arrived from Washington. As soon as the discharged men are paid, payment will begin for February to those remaining. The exact number of muskets in the arsenal is now 333,924.

Major-General Meigs, Quartermaster General, has issued an order requiring all the department officers and agents to forward to headquarters special reports of the number of persons employed, and the quantity and value of the supplies stored at the respective depots, and the means of reduction. They are also required to give an estimate of the stores necessary for a three month's supply, and the disposition recommended to be made of the balance, whether by sale, transfer, or otherwise.

Within a few weeks the Government expenses will probably be reduced to the extent of a million a day. A hundred million of dollars will be paid out to discharged soldiers and sailors during the current month.

IT takes two thousand feet of lumber to make a freight car. A well-built platform car is worth $1,000.

Ship-building in Philadelphia.

At the ship-yard of Mr. John W. Lynn, foot of Reed street, a handsomely modelled brig, of 600 tuns, is on the stocks, which will be launched shortly. She is to be called *Henry and Louisa*, and is being built for the firm of Henry Becker & Co., of New York City, and is destined for the West India trade. The vessel will be launched full-rigged, which will be a novelty in these parts. Last season Mr. Lynn built a large steamship for a Baltimore house, and a steamship previously for a New York firm, all showing that the reputation of Philadelphia shipwrights has extended to other cities. Besides the brig there is a large steamship on the stocks of about 1,700 tuns, built for Messrs. E. A. Souder & Co., of this city. This will be about the best steamship ever constructed for commercial purposes at this port. Her length is 250 feet, beam 38, and 26 feet depth of hold. She is destined to trade between New York and New Orleans. It is expected that she will be ready for launching in about two months.—*Ledger.*

[Mr. Lynn is the patentee of a remarkably fine machine for sawing out ship timber, and is in every sense a first-class mechanic. We have had at our office a number of his inventions, all of which are both ingenious and practical.—EDS.

Constitution of Steel.

The *Mining Journal* says:—The Royal Academy of Sciences of Belgium has awarded the gold medal proposed to be given to the author of the best work on the Constitution of Steel to Capt. Caron, so well known for his researches on this subject. M. Stas, the principal of the persons appointed to examine the essays, in commenting on Capt. Caron's work, expresses his own entire concurrence in his opinion, that iron in passing into the condition of steel does not take up any nitrogen in addition to that which it originally contained. Steel, he says, is essentially composed of iron and carbon, and owes its qualities or its defects to two different causes—the state of the carbon in the metal, or the nature of the foreign bodies which debase it. Whenever steel is good its carbon can, under the influence of tempering, combine with the metal, and gives us a hard, brittle metal, which further tempering renders supple and elastic. When steel becomes bad after undergoing several heatings it is due to its carbon having been burnt or separated from the iron, and tempering will not then regenerate the combination. This separation is due to the presence of foreign bodies, more especially silicium. These bodies also give to the metal defects varying with their nature and the impurities they contain.

The Maple-sugar Season in Vermont.

The sugar harvest in Vermont is just ended. The flow of sap was about an average, though greater than that of last season. Sugaring came on early and in earnest—taking most of our sugar-makers unawares. Sap began to flow about the 18th of March, and continued for 12 or 14 days in succession, affording an extraordinary and almost unprecedented run. The most and the best sugar of the season was made during these two weeks. The sugar made is of unusual whiteness, nearly as fair in many instances as the "coffee crushed" of foreign manufacture. This is owing in part to the continued flow of sap for days in succession (nights of course excepted,) thus preventing sourness in the tubs, and to the absence of storms, so that the sap has been free from rain and snow water, either of which very much injures the quality of the sugar.

The sugar season has been "short and sweet," four weeks scarcely intervening from first to last.

THE following should have been published in our issue of May 6th, in connection with the illustration of the "Improved School Settee:"—Three patents have been obtained through the Scientific American Patent Agency on the above articles of school furniture, dated respectively Sept. 29, 1863; Oct. 13, 1863, and Nov. 15, 1864. For further particulars address Jas. Monteith, Washington Hights, New York City, or D. I. Stagg, No. 15 Morton Street, New York City.

WHITEWASH.—Whitewash is not only one of the cheapest and easiest modes of rendering rough woodwork sightly, but is also a capital reflector of light, so that all dark passages, alley-ways, stairs, workshops, etc., are greatly improved by coats of it.

Breech-loading Rifle.

If the Government does not decide to adopt breech-loading weapons, it will not be for lack of variety to choose from; for, during the last few years, inventors have been active in this field, and very many breech-loaders of different patterns and principles of action are the result.

The gun here shown is of that class provided with magazines from which continuous rounds of ammunitions are forced out by springs or equivalent devices.

Fig. 1

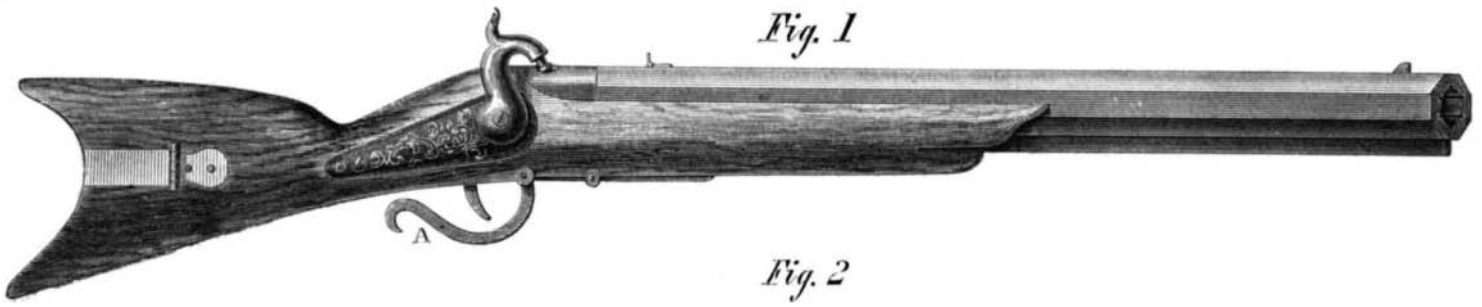
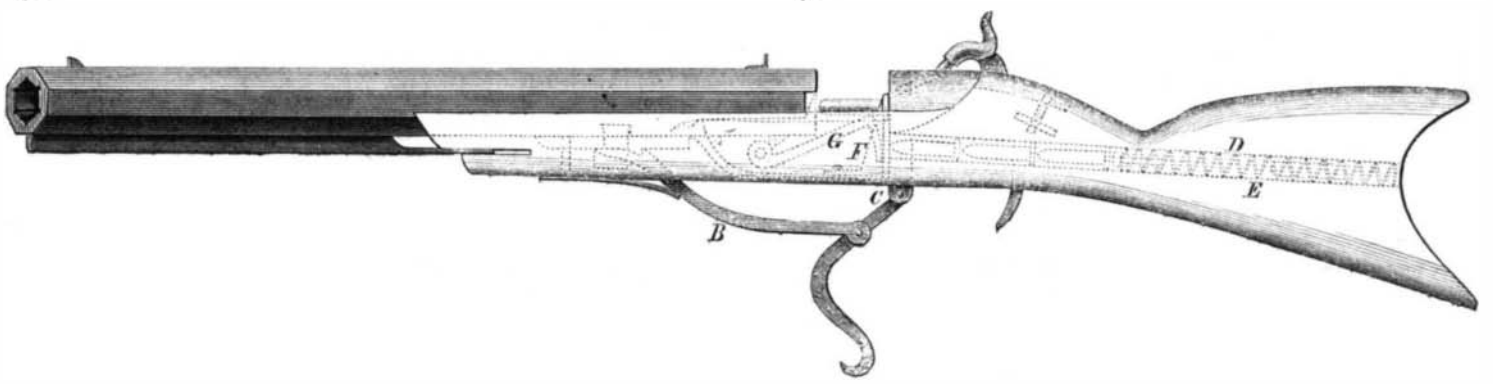


Fig. 2



ROBERTS'S BREECH-LOADING RIFLE.

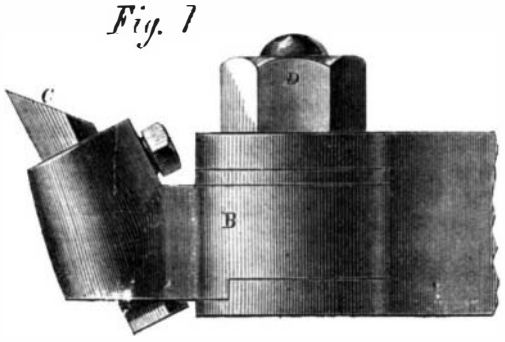
This weapon is peculiar in some details, one being that the barrel is removed from the breech piece in order to insert the charge instead of the reverse, as is generally the case. This action is obtained by working the lever, A, which is connected to the barrel by a bar, B. This bar being fastened to a lug, C, causes the barrel, when the lever, A, is worked, to be thrown forward; when the lever is reversed and brought close up to the under side of the stock, the barrel is firmly held up to the breech pin and magazine, so that no leakage of gas can occur.

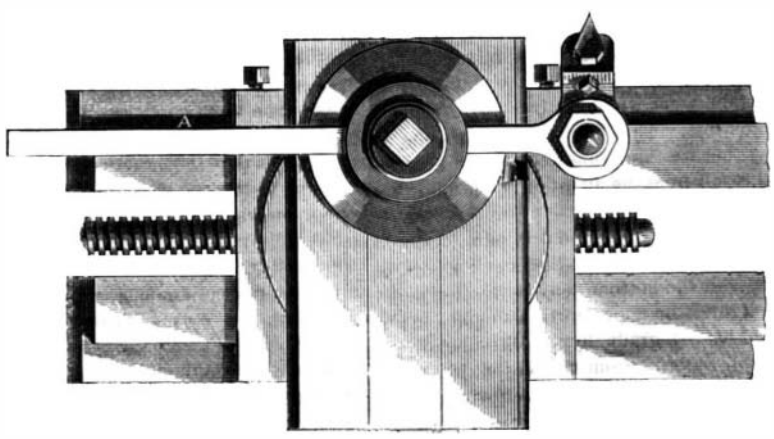
Fig. 2 shows the magazine, D, in dotted lines, as also the spring, E, which forces the cartridges up to the jaw, F; this jaw, in connection with the cam lever, G, guides the cartridges and elevates them to the level of the bore of the weapon. It also serves to expel the empty shell of the cartridge when the charge has been exploded and to prevent the premature issue of the charges from the magazine. These details comprise the whole of the weapon, and it is both simple in design and cheap to construct. The inventor is a soldier in the Army of the Potomac, and his practical experience and observation have guided him in designing this rifle. It can be used with fixed or loose ammunition as emergency requires. It was patented through the Scientific American Patent Agency on the 27th of Dec., 1864, by R. Roberts; for further information address him at Utica, N. Y.

Improved Tool Holder.

Lathemen, who work metals, are well aware that boring tools sometimes require to be made very long —to reach through a pulley, for instance, or a fly-wheel with a deep boss. For such work, a bar is generally provided with a square hole in one end, to which is fitted a short cutter. This bar is not adjustable, except in its length, and the cutter in it can only be used at right angles. The accompanying engravings represent a useful improvement in this class of tools, which adds very much to their efficiency. The change consists in simply furnishing the bar, A, with a short joint, B; this joint is formed into a socket at one end in which the cutter, C, is set and held by the set screw. This arrangement permits the tool to be moved at any angle and there secured, and will save much time in grinding the same, for it frequently happens that more has to be cut off one end of the hole than the other, owing to the draft on the core, so that the tool binds or strikes sideways, unless unusual clearance is given; by running the tool-post carriage back, and setting the cutter on one side, this difficulty is obviated, and the work can proceed. It is also applicable to planers or other machines, and in working around the hubs of rock-shaft arms or cranks, it would be very useful. By tightening the nut, D, the joint can be secured in place. A patent on this tool bar was procured Feb. 21, 1865, through the Scientific American Patent Agency. For further information address the inventor, Chas. Pelet Benoit, Detroit, Mich.

Fig. 1





BENOIT'S TOOL HOLDER.

Secret Plans for Extracting Gold.

The writer of this once saw in Marysville, California, a New York baker who had sold out his ovens and wagons in this city to purchase and practically apply a secret process for extracting gold from quartz by melting the rock. He had tried the plan and was describing the result. He had succeeded in melting the quartz, but was astonished at the intense heat required.

"When the rock cooled," he said, "it looked just like glass!"

We remarked that the secret probably consisted in using potash, as glass is made by melting together silex and potash.

But the man, having paid solid money for the secret, did not choose to continue explanations which might lead to its more complete revelation.

At the present time there are a great many men in this city who are dabbling in mining stocks and mining adventures of all sorts. Priding themselves on their keen shrewdness, they are the most fit subjects for sharpers, and are constantly making large losses, which they conceal insilent mortification, while their occasional lucky speculations are sure to be generally made known.

Not long since a quiet individual from the country was mysteriously intimating among these eager speculators that he had a secret for dissolving gold from crushed quartz, in place of extracting it with mercury in the usual manner, by which the yield could be very largely increased. After considerable negotiation, and after showing one of the shrewdest and most cautions of the speculators that the liquid would actually dissolve gold as completely as water will dissolve salt, he sold the secret for $500, cash in hand. It was not long before the lucky purchaser found that he had paid $500 for a receipt for making *aqua regia*, a receipt to be found in every hand book of chemistry, which could be purchased for $1.

In nearly every case where a secret is offered for sale it is either something well known to those familiar to the art, or it is a plausible novelty, which for some reason is impracticable and worthless.

Coffee in Pods.—An exchange, noticing the fact that coffee had been raised in this State, says, "it was planted in rows similar to peas, and the berry was contained in pods in the same manner." Coffee does not grow in pods, but in berries, of which the kernel, or the pit, as it might be called, is the berry. Coffee on the tree looks much like a cranberry or cherry.