Turning Irregular Forms.

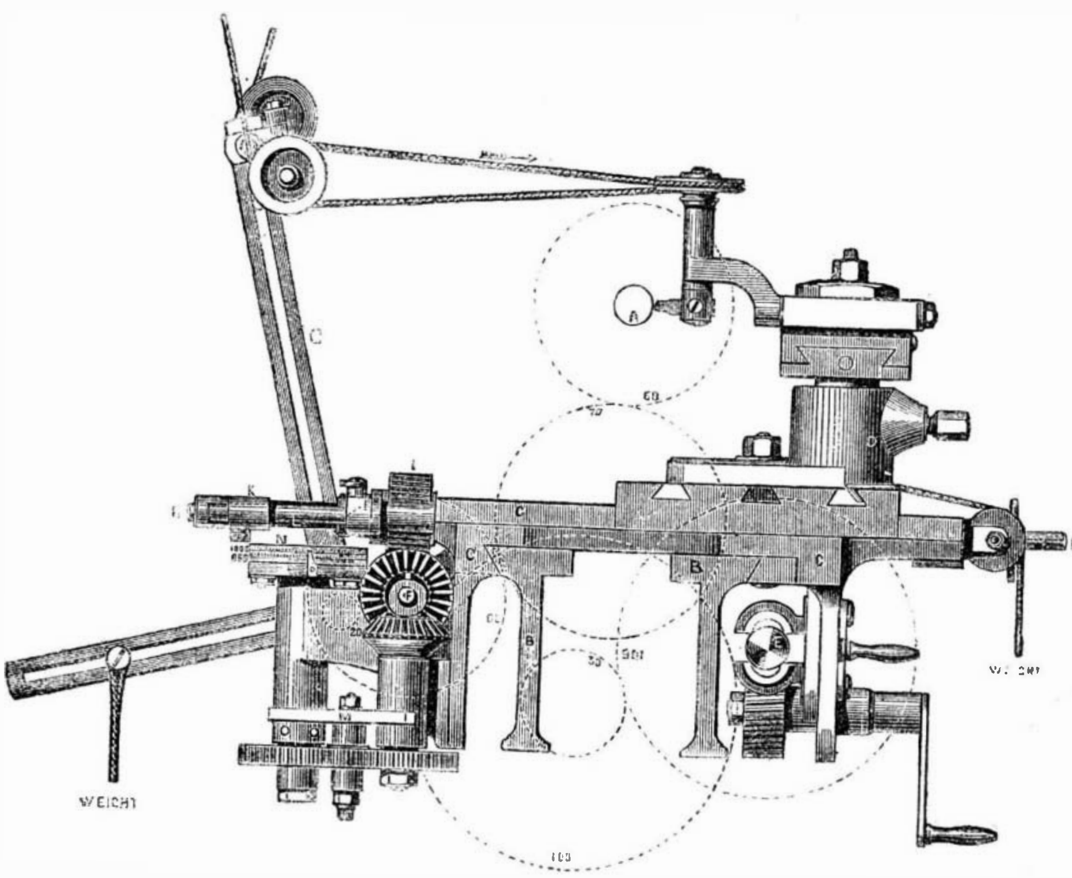
We illustrate from the *Engineer* an ingenious slide rest, designed by Mr. W. H. Northcott for turning articles of irregular sections. This system differs from the Blanchard and other lathes, because it is applicable to ordinary slide and screw-cutting purposes, as well as to turning irregular forms.

A is the center line of lathe spindle; B is the lathe bed, which carries a pair of ordinary headstocks; C is the saddle of the slide rest, which is caused to travel along the lathe-bed in the usual manner by the leading screw, E; D is a rest-holder, bolted down on the surfacing slide, for receiving and carrying any convenient form of tool-holder and slide; an ordinary short slide and Willis' holder is shown in place and carrying a light fly-cutter. This cutter is driven from overhead by means of a cord or gut, which is kept strained in every position of the slide by means of the lever, G. The shaft, F, and the leading screw, E, are driven from the lathe head by suitable change wheels which of course vary according to the relative speeds required, but generally the shaft, F, at the back of the lathe bed runs at the same speed as the lathe spindle. The surfacing slide carrying D, is caused to move across the saddle by means of the screw, H, either by a handle in front or automatically by means of a worm-wheel, I, driven by a worm on the shaft, F, the motion of the worm, I, being commumnicated at will to the screw through a sliding clutch. The surfacing-screw, H, is continued past the worm-wheel and clutch, and at its end is fitted with a bearing and adjusting nuts, to run in a cross head, K, which cross head slides on guides, L, one each side of the screw. The shaft, F, carries a small wrought iron miter wheel which rotates with the shaft, but, by sliding along it, is enabled to follow the saddle anywhere along the bed. This miter wheel gears with a similar wheel below it, attached to a short stud or shaft, having its bearings in a casting fastened to the slide rest saddle. At the lower end of the vertical shaft is a spur wheel, one of a series of changes any of which may be used to obtain the required speed. There is also another longer vertical spindle placed at the back of the saddle, and which rotates in a long boss forming part of the same frame. At its lower end this spindle is also fitted to receive a change wheel, driven either directly from a wheel on the other spindle or through double or single intermediate carriers by the short, radial arm, M. The top of the long spindle has a large collar or disk, to which is fastened another disk or receiving plate, N. The fastening is made with two small bolts with T heads fitted into a circular undercut groove in the top plate, and passing through the collar below. The edge of one plate is graduated, and the other has a pointer attached to it, so that the top plate may be moved round any distance, and fastened by tightening the small nuts below. The top surface of the upper plate has a number of holes in it which are tapped to receive screws, and also a larger hole in the center. These holes serve for fastening the various shaper plates or cam plates to the disk. The sliding cross head, R, carries a suitable rubber, O, placed just below the bearing of the surfacing screw, and the shape of this rubber depends upon the shape of the copy-plate, being sometimes a flat bar, at others a roller, and sometimes an angular point. The surface screw, H, has its usual bearings in the metal of the rest saddle, but the collars to the front bearing are formed by four nuts which allow of any end play being taken up. The inside pair of nuts, however, must be screwed back when the irregular mechanism is in use, as the screw has to slide endwise in its bearings. On the lathe being started, the bevel-wheel on the shaft, F, drives the first vertical spindle, and this motion is communicated by the change wheels to the copy plate attached to the top of the long spindle. The shaper plate in rotating being pressed against by the rubber, O, causes the cross head, K, and screw, H, to reciprocate or slide endwise, and the reciprocating motion of the screw is of course partaken of by the surfacing slide and cutting tools carried by the slide. The velocity of this reciprocating movement will vary according to the shape of the copy-plate, and its shape will therefore govern the shape of the work produced. The rubber is kept in contact with the copy by a weight attached by a cord to the surfacing slide, passing over a small pulley in front. With the tools point-level with the center, with an eccentric circle for the copy-plate, and with equal rotations of copy and work, when the tool's point describes a figure much smaller than the copy-plate the shape produced is cardoid, or heart-like, and this shape becomes more decided, and finally becomes looped as the tool gets near the center. When the figure is of the same size of the copy plate, its shape is also the same, namely, an eccentric. When the figure is made much larger than the copy-plate its shape is still somewhat the same as the copy, but its eccentricity is not increased.

It will be understood that when articles of irregular transverse section only have to be turned, the work and copy-plate generally make equal rotations; when the position of the shape has to vary there must be some slight difference between their speed. But by giving the copy a very slow motion compared with the work, instead of the article being turned of irregular transverse section, it is turned circular, but of irregular longitudinal section. For example, by having a shaper-plate formed of a portion of a true spiral, tapering shafts can be produced. If the spiral copy have a rise of ¼ inch, the large end of the shaft will be ½ inch larger in diameter than the small end, and the length of the taper will be equal to the distance traveled by the tool while the rubber has traversed the edge of the spiral copy-plate.

The drawing rollers of spinning machinery, handles for starting levers, bolts with countersunk heads, and many other articles frequently required in large numbers, can also be produced from suitably formed copy-plates; while for cabinet-making and for ornamental turning the applications of the mechanism are almost endless.

The device is interesting as its capacity is more extended than the Blanchard lathe, familiar to American mechanics.



SLIDE REST FOR TURNING IRREGULAR BODIES.

BORING INSECTS.

Many of the lower forms of animal life possess powers of boring which, considering the soft materials of which they are made, seem very surprising. It is hard for us to understand how such animals are naturally provided with tools adequate in some cases for penetrating into the densest timber, or in others even into the solid rock.

We find no difficulty in understanding how shellfish can bury themselves in the sand—the common cockle is an excellent burrower in this yielding material. The razor-shell dwells in a long tube in the sand which he has formed by his own labors, from which he can only be extracted by darting down it a long barbed rod. This penetrates his shell and he is withdrawn; but if this be not done with great rapidity he is enabled to escape, as he can move very quickly in his hole. There is another shell belonging to the same tribe as the razor-shell, which excavates for itself a hole in the solid rock. This animal has no English name; its Latin one is *Pholas*. It is to be met with in limestone rocks on the sea coast, into which it bores holes to a depth of several inches.

It is still a disputed point among naturalists as to how this boring is effected. Some think that the animal is enabled to secrete some acid which softens or dissolves the limestone, while others think that it is by the mechanical process of grinding that it is accomplished

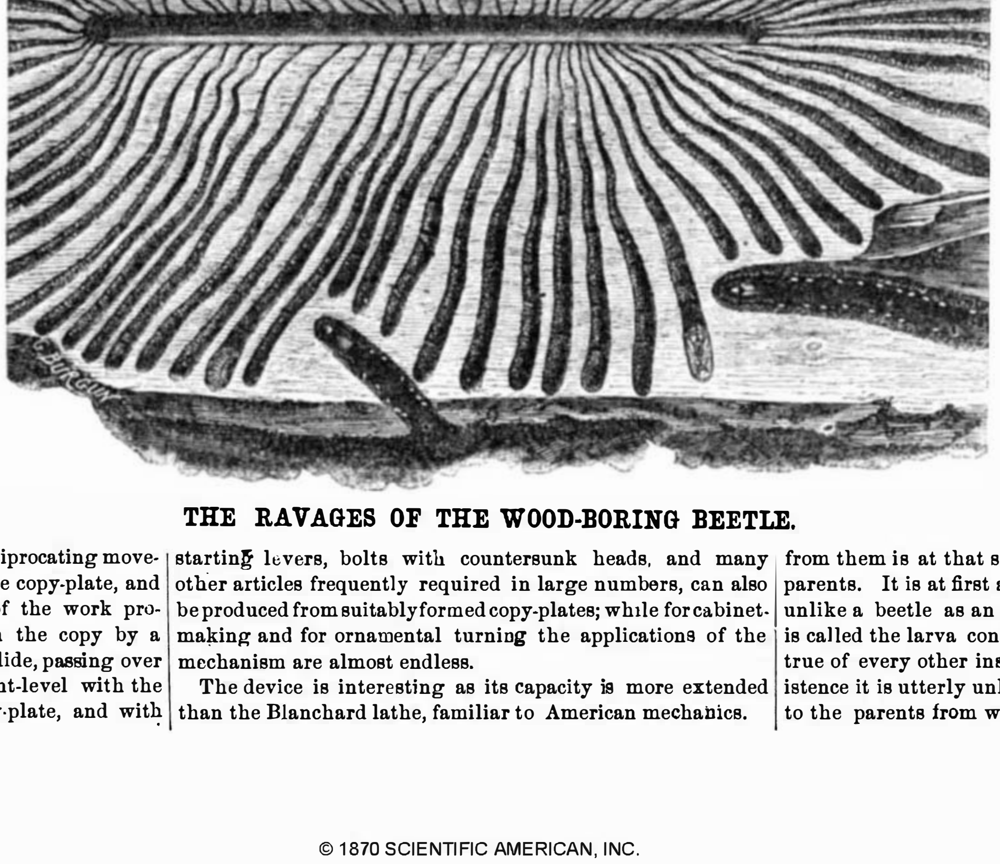
The preponderance of opinion seems to lie now with the latter view. Another boring shell is the well-known ship-worm or teredo. This burrows into wood to a great depth, and many an otherwise good ship has been rendered unseaworthy by the attacks of this indefatigable borer. Of course a metallic coating to the vessel is a complete preservative against their attacks.

Our illustration represents a borer of a very different kind. The animal that accomplishes these excavations in the trunk of a tree is not a shell-fish, but an insect. The parent, when about to deposit her eggs, selects a tree of suitable size, and commences her operations on the bark. At the bottom of the illustration will be observed a small inclined hole, and at the end of this a beetle is to be seen; this is the little architect who, by the joint exertions of herself and her progeny, has so wonderfully penetrated the tree in every direction. Another hole, running horizontally across, will likewise be seen at the right of the figure, and in the end of this another beetle may be seen similarly engaged. When the exertions of the insect have prepared a sufficiently large hole she then commences to lay her eggs. But before proceeding to this subject, let us just dwell for a moment upon the magnitude of the work she has accomplished.

The hole bored into the heart of solid wood is about fourteen or fifteen times longer than the body of the beetle, and the animal must, by the help of its jaws, tear away and remove a bulk of timber more than twenty times its own bulk. We shall gain some idea of the amount of labor necessary for this, by considering what would be the corresponding work that should be executed by a man, were he to be equally adapted with the beetle for this kind of work. He would have in a few days to bore into a mass of solid timber a cylindrical hole, about eighty or ninety feet long, and about three feet in diameter.

The central part of the illustration shows another stage in the history of these tunneling operations. We will suppose that a beetle has finished the hole of which the two already described are the commencements. All along each of these will be seen little white spots; these represent the eggs which she lays as she proceeds. The long line in the center of the figure represents a part of the completed hole, along the sides of which the eggs are laid.

When the eggs of the beetle are hatched, the little animal that comes from them is at that stage of its existence utterly unlike its parents. It is at first a little grub without legs, and quite as unlike a beetle as an earth-worm is unlike a house-fly; this is called the larva condition of the beetle; and it is equally true of every other insect, that in the early stages of its existence it is utterly unlike in appearance, in food, and habits, to the parents from whom it has sprung. Thus the dragon-



THE RAVAGES OF THE WOOD-BORING BEETLE.

fly, with which we are all so familiar, and which is such an ornament to our streams, was, when young, an unattractive and somewhat ferocious-looking grub, wholly resident in the water, over which, when mature, it skims, but which it never touches. The food, too, of the larva of the dragon-fly is quite different from that of the mature insect.

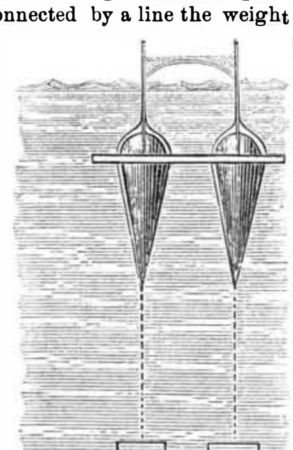
This being understood, we shall not be surprised to find that when the eggs of the beetle we are describing are hatched, the young that come from them are quite unlike their parents. They are small white grubs, rather uninteresting in appearance, but endowed with a most tremendous appetite and vast powers of digestion. The food which supports the little grub is the solid wood of the tree itself. It will be remembered that each egg was deposited on the side of the hole, and there it remains attached until it is hatched; thus the little creature finds, the moment it becomes conscious of its existence, the food which nature intended for it surrounding it in boundless profusion. At once it commences to eat the wood that is under it, and thus it speedily excavates for itself a little hole, the bottom of which gradually deepens as the insect proceeds. Its brothers and sisters, likewise hatched about the same time, commence each to eat their small hole, and thus from the main tunnel a number of small holes gradually extend through the trunk, all commencing, of course, from the hole originally made by the parent insect.

Now, as the little grubs progress onwards, they, at the same time, grow in size, and their appetite consequently increasing, the hole gets gradually larger, and this is, of course also necessary to allow for their increased dimensions. Gradually they proceed farther and farther from the center, and approach nearer and nearer to the outside of the tree; but just before they finally emerge, when they are just beneath the bark, a curious change comes over them. They have now grown to be as large as their parent, but still they are grubs; they have not donned the legs and wings which are necessary for the perfect beetle, but the tree which has housed and fed them in their infancy still affords them shelter till their final development. As they get near the bark they cease to eat, and fall into an inert condition; but all this time a wonderful change is taking place within their bodies—they cast off their skin and are transformed into perfect beetles. Speedily they emerge from the tree to find themselves in a new and wondrous world, and to use and enjoy those powers of flight which they have so recently and so curiously acquired. Truly this is a very astonishing history; we have seen one beetle boring into a tree, we see a hundred emerge from it; the solid substance of the trunk has afforded nourishment to the numerous offspring. There is no more interesting department of natural history than that which treats of the habitations of insects; and there is, perhaps, hardly any insect more interesting in this respect than this wood-boring beetle.

SUBMERGED BUOYS AS A BASIS FOR STRUCTURES IN DEEP WATER.

The following, from a letter from Mr. Thomas Morris, of Carlton Chambers, England, to *The Engineer*, appears to us to contain a good idea.

"The purposes and situations of structures in deep water are so numerous and various that every available principle becomes worthy of record. I suggest the application of submerged buoys to such uses, and my reasoning is this. If you have a water-tight vessel with a certain floating power, say equal to 100, and to that vessel you attach a weight equal to 110, and cast it into the water, both weight and float go to the bottom. But if they are connected by a line the weight alone sinks to the bottom, and as soon as it has found its resting place the descent of the float ceases. It becomes stationary above the weight, with the length of the line between them. In this situation the float possesses a remarkable property; the original weight having ceased to exert a sinking force, it can only be farther depressed by a new load greater than its ascensive power of 100. In still water a vessel wholly submerged has obviously great advantage in point of economy, perhaps four fold, over one partially immersed; but where



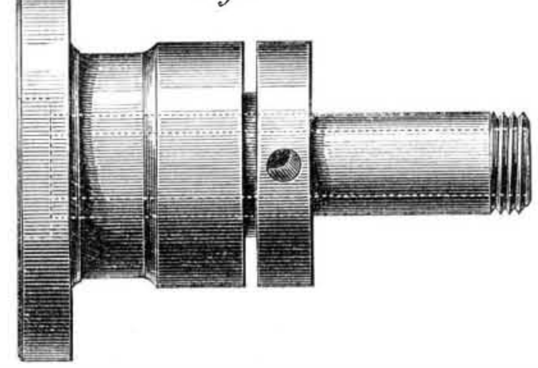
the surface is agitated there is the further advantage that the submersion may be fixed at the dead water point, and uprights of small comparative sectional area alone be exposed to the action of waves. The figure shows a couple of these buoys applied to the cross section of a pier or jetty where the upright posts, horizontal bearers, platform, and parapet, being well connected and braced, would give firmness and the requisite degree of rigidity. It is supposed probable that some means of submerging the buoys may supersede the use of weights should the principle be practically adopted; and from the known effect of deep water currents, some kind of anchorage would be essential in situations exposed to their influence."

A CORRECTION.—In our description of the Bolt Cutting Machine, manufactured by the Howard Iron Works, Buffalo, N. Y., published on page 215, current volume, a typographical error occurred which might mislead some of our readers. In the fifth line the first word should be *three*, instead of "these," as the types made us say. The sentence should read "The machine herewith illustrated has three dies in the cutter head," etc.

IMPROVED PACKING STEAM DRYING CYLINDERS ON PAPER MACHINES.

We are informed that the invention we herewith illustrate has been applied to two hundred and twenty-five cylinders during the past year, and has been tested under pressure of seventy pounds with marked success.

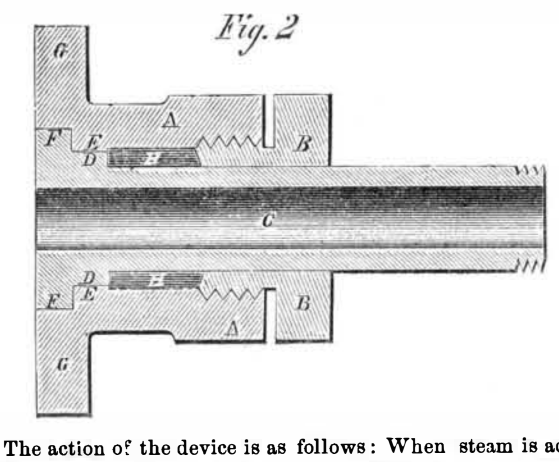
Fig. 1



The stuffing box is shown entire in Fig. 1, and in section in Fig. 2. A is the box containing the packing material, and B the packing nut. The box, A, has a flange, G, by which it is bolted to the end of the cylinder, with which it revolves; the steam induction pipe, C, remaining stationary. The box, A, is also provided with an internal shoulder, D.

The inner end of the induction pipe has two shoulders, E F, formed upon it. The packing, H, is of rubber, or any suitable material.

Fig. 2



The action of the device is as follows: When steam is admitted to the cylinder, the pressure therein of the steam acts upon the end of the pipe, C, to thrust it outward, whereupon the shoulder, E, compresses the packing, H, and keeps it tight.

Though originally designed for steam drying cylinders on paper machines, upon which it has been extensively tried, and proved to be very satisfactory, it is obviously adapted to various other uses.

Patented, through the Scientific American Patent Agency, June 8, 1869. For further information address W. B. Fowler, patentee, Lawrence, Mass.

A Valuable Invention.

A few weeks ago there appeared, in the SCIENTIFIC AMERICAN, an article calling attention to the great waste of labor involved by the present method of raising bricks and mortar to the upper stories of buildings under construction, and asking if it were not possible for the genius of our inventors to produce a remedy for the evil. *The American Builder* says this question has been answered in the most practical manner by a Chicago builder, who has invented a machine by which two men can easily and rapidly accomplish the labor of several, effecting a saving, not only in money and labor, but in time also.

The apparatus, which is destined to do away with the tedious practice of carrying the material for building up long ladders, endangering the lives of workmen, and involving such an amount of unnecessary work, is described as follows:

Two endless chains, made of any required length by a simple device, connected together at intervals of about a foot by iron cross-bars, pass at their lower extremity over a broad pulley or wheel, located as in an ordinary windlass, such as is usually employed in raising stone where a crane is used, and worked in a similar manner. The parallel endless chains thus connected pass over another broad pulley or revolving wheel, supported on four legs, much as a grindstone is usually placed. This upper pulley is put in any part of the building where the bricks may be wanted, usually in the inside. The ordinary hods are used to raise the bricks and mortar, with the addition of a broad, stout, iron hook projecting downwards at the end of that part of the hod containing the brick which is farthest removed from the shoulder when carrying. The hod, being filled, is hooked by the contrivance mentioned to one of the cross-bars of the endless chain, the handle pressing upon the lower cross-bars and acting as a lever to keep the hod firmly in position; and, as two men work the windlass is raised to any required hight. The hods can be placed as close together as their length will allow. The empty hods, in a like manner, are hooked at the top of the machine on the descending side and received by the workmen on the ground. Probably the best method of placing the machine is in the interior of the building, where the legs supporting the upper pulley over which the parallel endless chains are made to pass are placed so as to locate the pulley directly over an aperture through the loosely laid floor of the story where the material is required. These legs may be of any length, and the hods can be raised to the shoulders of the workmen who deliver their contents to the masons. The machine is already in practical operation, with the most satisfactory results, in a large building now erecting in Chicago, and two men raise easily four hods a minute to the fourth story. Of these hods three usually contain brick, and one mortar, thus furnishing all the requisite material for carrying on the work. The hods contain on an average sixteen bricks each, and consequently in a day of ten hours, two men can raise nearly twenty-nine thousand brick with the mortar necessary for laying them. The laying of two thousand bricks is, we believe, a good average day's work for a mason, and two men are by this device enabled to raise the material for fourteen bricklayers. Those acquainted with the business will readily perceive the advantages of the invention. Of course men are required to fill the hods at the bottom and empty them at the top, but by no means what has been the usual number for doing the work are required. The apparatus simply substitutes a vastly better method for raising the material.

Professor Chandler on the Purity of Croton Water.

The water supplied to the citizens of New York, at the liberal rate of sixty-five gallons to each person daily, is collected by the various branches of the Croton river from an area of 338 square miles in Westchester, Putnam, and Dutchess counties. The character of this water-shed is a sufficient guaranty of the purity of the water. The surface of silicious gravel rests on hard Laurentian gneiss, and is open pasture or woodland, with few swamps. No factories line the streams, which are liable to contaminate the water with refuse chemicals, and no towns or large villages exist anywhere in the district to pollute the waters with sewage. A recent survey of the water-shed has indicated fifteen points at which dams can be erected for the creation of large storage reservoirs, whose joint capacity would be 67,000,000,000 gallons, or a supply, at the present rate of consumption, for 1,000 days. One of these dams, 650 feet long, is now in process of construction at Boyd's Corner, in Putnam County, twenty-three miles from the mouth of the aqueduct. When this dam is completed it will flood an area of 303 acres, and the reservoir thus produced will contain 3,369,206,857 gallons, or a supply for fifty to fifty-five days of drought.

Examinations were made of Croton water which had been in contact with lead for different lengths of time, under usually occurring circumstances, of which the following are the results:

1. A gallon of Croton water from a lead-lined cistern, in which it had stood for several weeks, was found to contain 0·06 grain of metallic lead.
2. A gallon of water which had remained six hours in the lead pipes of the chemist's residence yielded 0·11 grain metallic lead, a considerable portion of which was visible to the eye, in the form of minute white spangles of the hydrated oxycarbonate($PbO,HO + PbO,CO_2$).
3. Water drawn from one of the hydrants of the School of Mines Laboratory, in the middle of the day, when the water was in constant motion, yielded traces of lead. This water reaches the school through about 100 to 150 feet of lead pipe.

These results indicate the source of many hitherto unaccountable cases of lead poisoning, and are of a character to alarm the residents of New York, and to lead them to adopt precautionary measures for protection against this insidious cause of disease.

Many have already introduced as a substitute for lead pipe the "tin lined" or 'lead-encased block tin" pipe.

Chinese Pottery and Glass.

Po Shan, in the Lanfoo valley, contains extensive potteries, three different kinds of ware being manufactured—the fine straw-colored porcelain, the common red ware, and a peculiar shining black ware, very light, that looks like metal (lead), and is valued in districts where fuel is dear, in consequence of its rapid heating qualities. The red paving tile and the large red water kongs are also made here. Yen-shing has extensive glass manufactories of which foreigners are little aware. I was much surprised at the quantity and excellent quality of the glass. There is a quarry in the immediate neighborhood, from whence is obtained the stone which, pulverized and smelted with nitrate of potassa, forms the glass. This stone is similar to granite, only of a beautiful lilac color. Nearly every house in the city of Yen-shing, is either a glass manufactory, or a shop where glass ware is sold. We found them blowing glass, running it into rods and plates, making window glass, bottles, beads, lanterns, and ornaments of every description. Some very beautiful opaque bottles of different shapes and finely painted I procured here. The glass seemed extremely pure, and sold at very reasonable prices; the rods of pig-glass about 30 inches long, and 1½ inches in diameter, costing 30 cash a catty, or less that 1d. per pound. Saltpeter, much used in the manufacture of glass, is found in the vicinity of Po-shan-shien.—*J. Markham.*

Iceberg Alarm.

Mr. Charles Dion, of this city, proposes to place an apparatus on board of steamers and other vessels, so arranged as to sound an alarm on approaching the vicinity of an iceberg. The device is arranged on the bottom of the vessel, and is of such a nature that when the keel strikes any very cold strata of water the alarm is sounded.

It is well known that icebergs refrigerate the water around them to a considerable distance. Mr. Dion's instrument will exhibit the exact temperature of the water below the vessel at all times.