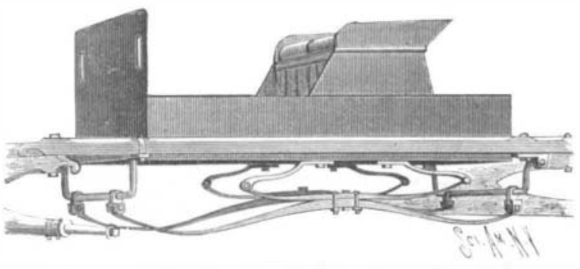
SIDE SPRING FOR VEHICLES.

The body of the vehicle is attached to jacks consisting of steel bars, serving to some extent as springs, and being jointed to the ends of short half elliptic springs, which are clipped at the center of their backs to the backs of longer similar springs, which have one end connected by shackles with a cranked bar suspended from under the front ends of the side bars. The other ends of the large springs are connected with a cranked bar suspended from the rear ends of the side bars in pivot bearings, thereby enabling the rod to swing sufficiently to accommodate the lengthening and shortening of the springs. The upper springs are connected to the others at about the same distance nearer the hind ends, as the weight of the riders is nearer these ends when seated in the carriage, thus permitting the springs to be more flexible in front than rear in the proportion that the load is lighter.



SHINNICK'S SIDE SPRING FOR VEHICLES.

This spring is applied to a rigid side bar frame without a reach. The strain on the upper sections of the springs is relieved, when forced down by the load, by the elastic action of the jacks, which work freely in the eyes by which they are connected to the springs. The lower sections of the springs, taking their share of the load, have free range for expansion and contraction by reason of the pivotal arrangement of the rear bar. The forward cranked bar, being rigidly connected to the side bars, makes less joints for wear and prevents the swing of the body forward and backward that would otherwise occur. The whole makes a spring that equally distributes the strains over all parts, thereby reducing the chances of fracture.

This invention has been patented by Mr. William Shinnick, of Shelbyville, Kentucky.

Quicksilver Mining in California.

The quicksilver industry on the Pacific Coast cannot be said to be in a flourishing condition. The long prevailing depression in prices has had the effect of closing down many producing mines, and only the larger ones can now afford to work, and they are not making much money for their owners.

There are altogether about 1,200 men directly employed in the quicksilver mines and furnaces of California, in addition to whom a large number are occupied as wood choppers, teamsters, etc., working on contract. The leading nationalities of the miners and furnace men may be stated in the following order: Mexicans, Cornishmen, Swedes, and Chinese, with comparatively few Americans. The Mexican miners, as in so many other instances, have developed a special fitness for this class of work, and their intelligence in finding ore amounts almost to an instinct. For the regular underground work of a mine, such as drilling, blasting, timbering, etc., the Cornishmen and Americans probably take the lead.

Miners at day work are paid from $2 to $3 per shift of ten hours, and on contract work from $2.50 to $3 per shift of eight hours. The wages of furnace men are $2 to $2.50 per shifts of ten or twelve hours. The New Idria mine gives employment to about 120 men. There the wages of white miners average $2.25 cents per day, the men boarding themselves. Blacksmiths and other mechanics and overseers are paid $4 per day. The Great Eastern mine employs 35 men, half of whom are Chinese. At this mine white miners are paid $2.50 per day, boarding themselves, and the Chinese, $1.25. The Napa Consolidated employs from 60 to 70 men at about the same wages. At the Sulphur Banks, when at work, 90 men are employed, and the same wages are paid as at the Great Eastern. In all these mines mechanics and foreman are paid from $3.50 to $4 per day. The Great Western gives work to 25 men; white miners are paid $1.25 per day and board; Mexicans $2.50 and $3 per day and board. At New Almaden, where a force of 500 men is kept at work, the average daily wages are $2.50.

An estimate has recently been made from the working results of different mines, showing that for every flask of quicksilver produced nine days' actual labor (calculated as if done by one man) is required. This, at the low average of $2 per day, would make the amount paid for labor $18 for every flask manufactured, or between 23 and 24 cents a pound. This, at present prices of quicksilver, does not allow much margin for profit after accounting for the other expenses, such as supplies, fuel, powder, flasks, steel, transportation, etc.—*Mining and Sci. Press.*

FILTERING CISTERNS.

BY G. D. HISCOX.

For the instruction of a large and increasing population that are more or less dependent upon cistern water for culinary purposes, and also in many parts of the United States or in foreign countries where there is nothing but rain water available for human thirst, we have prepared a few illustrations of the most approved forms and materials for filtering rain water that is stored in cisterns, especially for drinking and cooking purposes.

Among the things to consider in determining whether cistern water is safe to drink, are the cleanly or dirty condition of the roof, and the materials it is made of; whether leaves from overhanging trees fall upon the roof and lodge in the gutters; whether birds foul the roof; whether it is made of wood, slate, or tin, or of materials inimical to health—as lead, copper, or covered with deleterious paints.

The water taken from a cistern fed from a roof encumbered with leaves from an oak tree has been found so strongly impregnated with tannic acid as to turn water black when boiled in an iron pot.

In order to obtain the best results from filtering cisterns, the roof and gutters should be kept free from leaves and dirt, and it is also advisable to arrange the leader with a switch valve, with the handle convenient for operating within the building, so that the first wash may carry away the dust, dirt, or other foul matter, and thus save only the best water.

Caution should be exercised in locating cisterns that are intended to furnish drinking and potable water, that they be away from the influence of cesspools and privies, as clean water readily absorbs the odors, gases, and germs of foul air.

The materials selected for filter beds should be in accordance with the resources of the locality in which the filter is to be used, for the purpose of renewal.

We recommend such materials only as have proved reliable, leaving out all textile or organic substances, as we deem such unfit for this class of filtration.

Pulverized charcoal mixed with sand, or between layers of sand and gravel, so long used for filtering purposes, has a cleansing or antiseptic power, probably derived from the contact of a large carbon surface. Pulverized coke has been used, and is considered a fair filtrant, but less effective than charcoal. Bone charcoal has also been recommended as being highly antiseptic, besides having a strong absorbent power, due to the variety of its chemical components. It can be obtained from the dealers in New York.

Fig. 1.

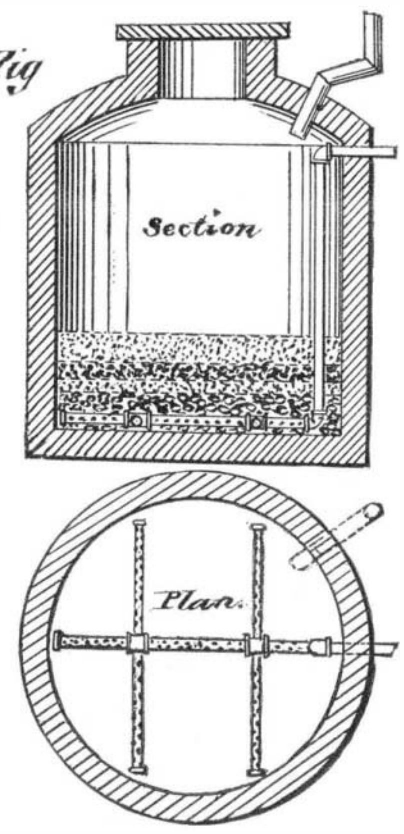
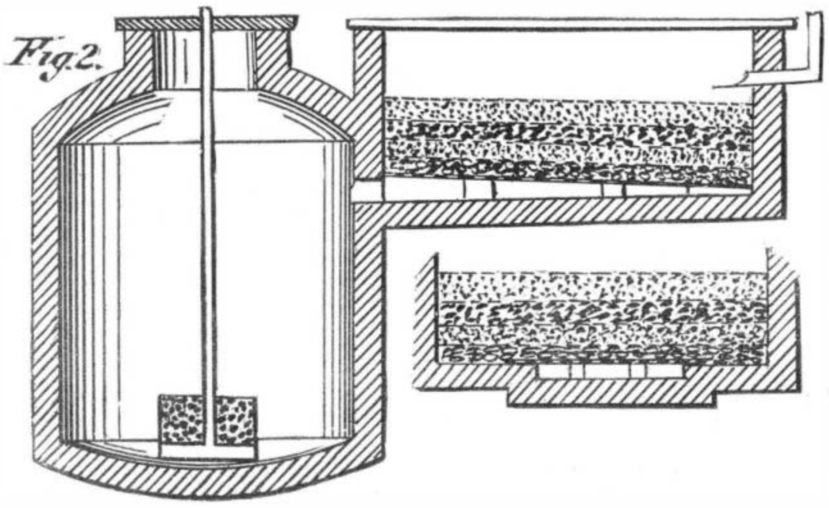


Fig. 2.



Spongy iron, or pulverized hematite mixed with sawdust and roasted; pulverized magnetic iron ore and clean scales from a blacksmith's anvil, pulverized and mixed with clean, sharp sand, have been much used and experimented with in Europe with great success, in not only making fetid water sweet, but it is also claimed that the iron mixtures destroy bacteria and their germs.

A combination of the two extremes, a large carbon surface in charcoal and the pungent oxidizing qualities of the spongy iron, or its equivalents, will no doubt become the acme of a filter.

From experiments made with the filters of public water works in Europe, for the quantity of water that a filter will yield per square foot of surface, it has been ascertained that, with a filter composed of 10 parts fine, sharp sand, 1 part coarse sand, 15 parts spongy iron mixed with one-third its bulk of fine gravel, laid upon a strainer of perforated galvanized iron—a bed of brick laid close—or a stratum of gravel covering a perforated iron pipe, a yield of one gallon of clear, pure water for each foot in depth per hour for each square foot of surface; four feet being the greatest depth with a yield of four gallons per foot per hour—illustrating the probable fact that the velocity of the water corresponds with the depth of the filtering material for equal purity.

Fig. 3.

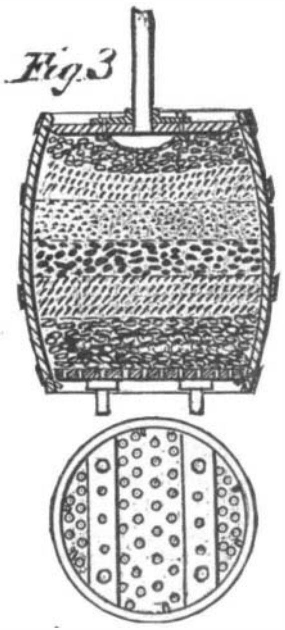


Figure 1 illustrates a method of preparing an ordinary house cistern for filtering. The pipe and fittings should be of galvanized iron; black or plain iron is better, as long as it lasts, as it rusts fast; in either case it is better to waste the water first drawn, for the water absorbs both the zinc and the iron when standing over night. The zinc is not healthy, and the taste of the iron is unpleasant.

The perforations should equal three or four times the area of the suction pipe, which in ordinary cisterns may be $1\frac{1}{4}$ inch pipe, while the branches may be $\frac{3}{4}$ inch pipe. The holes, if $\frac{1}{8}$ inch, should number at least 200, distributed along the lower half of the pipes. Smaller holes are preferable; of $\frac{1}{16}$ inch holes 800 will be required.

For the filtering material we recommend a layer of fine gravel or pebbles for the bottom, 3 or 4 inches in depth, or heaped up over the perforated pipes; upon this a layer of sharp, clean sand, 9 inches in depth, upon this a stratum of pulverized charcoal, not dust, but granulated to size of peas or beans, or any of the material above mentioned, 4 inches deep; and upon this a stratum of fine, clean sand from 6 to 2 inches in depth, making a total depth of from 16 to 20 inches.

Such a filter should be cleaned at least twice in a year by pumping out all the water, taking out the mud or settlings, and one-half the depth of the top layer, and replacing with fresh sand.

The double filter cistern, Fig. 2, has much to recommend it, having a large receiving basin which in itself is a filter placed in a position for easy cleaning. The recess at the bottom may be covered with a perforated plate of galvanized sheet iron, upon which may be laid a filter bed of gravel, sand, charcoal, spongy iron, and sand in the proportions as stated above. This enables the frequent cleaning by removing the top layer of the filter bed without disturbing the water supply. The cover should fit tight enough to keep out insects and vermin.

A double bottomed basin perforated and filled with clear, sharp sand and charcoal should be attached to the bottom of the pump pipe as shown in Fig. 2.

This enables the small filter to be drawn up and cleaned, without the necessity of emptying the cistern or interrupting the water supply.

The half barrel or keg filter, as illustrated in Fig. 3, is a convenient form of cistern filter where filtered water is required from cisterns already filled.

This is also a convenient form for readily cleaning or changing the filter without the necessity of discharging the water from the cistern.

This filter can be made from an oak keg or half barrel, such as is used for liquors or beer. Take out one of the heads and cut away the edge, so that it will just drive into the end of the keg; fasten two battens of oak across the head with oak pins left long enough to serve for legs for the filter to rest upon.

Bore this head full of holes one-quarter inch diameter. In the other head bore a hole 1¼ inches diameter, and bolt an iron flange into which the pump pipe is to be screwed. Let the bolts also fasten upon the inside a raised disk of galvanized sheet iron, perforated with a sharp point or chisel. Proceed to charge the filter by turning the top or flanged head down, and placing next the perforated plate a layer of fine gravel 3 inches thick, then a layer of sharp, clean sand 4 inches thick, then a layer of pulverized charcoal free from dust, 3 inches thick, then a layer of sharp, clean sand mixed with spongy iron, pulverized magnetic iron ore, or blacksmith's scales, followed by a layer of coarse sand, gravel, and broken stone, or hard burnt bricks broken into chips to fill up. Place the perforated bottom in as far as the head was originally; bore and drive a half dozen oak pegs around the chine to fasten the head. Then turn over the filter, screw the pump pipe into the flange, and let it down into the cistern.

Such a filter requires to be taken out and the filling renewed in from 6 to 12 months, depending upon the cleanliness of the water catch. With the precautions mentioned above in regard to the care of the roof, such a filter should do good work for one year.

Dr. Meldon's Electric Motor.

Electricity, both as a means of lighting and locomotion, has made, during the past few years, such vast strides in public favor that it is not surprising many discussions have been raised concerning it, or that the minds of the leading scientists have lately become engrossed with the study of so interesting a subject. Up to the present, however, owing to the enormous amount of electricity required to work even a medium sized dynamo, all attempts at electric propulsion—especially as regards boats—may be considered as purely experimental, its most ardent advocates being unable to claim for it any economical advantage over steam.

Many theories have been adduced toward, and several electricians have applied themselves to the task of, surmounting this difficulty; but it is to the intelligence and ingenuity of an eminent Irish physician that the scientific world is now indebted for the discovery of an important principle, which will, without doubt, be recognized in future in the construction of all magneto-electric machines. To Dr. Austin Meldon, of 15 Merrion Square, Dublin, belongs the credit of having designed a motor which not only does away with the manifold disadvantages and drawbacks attendant on the employment of dynamos, but also creates the largest amount of driving power with the least expenditure of electrical force.

Dr. Meldon, in his first attempt at motor construction, made use of twelve magnets, but when the machine was tested it was found that although each of the magnets would lift half a cwt., or attract a heavy iron bar from one inch, yet the whole twelve, when bound together, would only lift or attract exactly the same weight. Seeing that something was evidently wrong he sought information as to the cause of so singular a circumstance, but although he received a very large number of suggestions not one of his correspondents hit upon a solution. Nothing discouraged, Dr. Meldon persevered in his investigation, with the gratifying result that after some trouble he found that the inertness of the magnets was due to neutralization, and that by magnetically insulating the bars—about to be described—with copper instead of iron bolts, and putting a few layers of gutta-percha between the bars and the rims of the wheels, he could develop full power—a fact which seems to have been hitherto unknown.

The armature of the new machine is formed by joining together two 15 inch solid pulley wheels, with seven flat bars of iron, each bar being 24 inches long by 3 inches wide and 1½ inches thick, and, as has been observed, the bars are laid upon gutta-percha, copper bolts being used to fasten them to the wheels. A shaft of 1½ inch steel passes through the center, and the whole is supported by a hard-wood frame, stayed with iron. Each side of the frame, where the shaft emerges therefrom, is supplied with an ivory commutator, the one on the right having three, and the other four brushes, each of which communicates with a magnet. Attached to the frame are seven electro magnets, the three larger ones being made of 2 inch soft iron, and wound with No. 14 wire, without bobbins, and the other four of 1½ inch iron and wound with No. 11 wire. The total weight, as at present constructed, is a little over 3 cwt.

The first trial of the motor took place in July last, in a boat 22 feet long and 5 feet beam, and the battery used on the occasion consisted of thirty-six cells of bichromate of calcium, with zincs 6 by 4 inches, and carbons 6 by 5 inches, the latter, as will be observed, *being larger than the former*. Half of the cells passed through a commutator into one set of magnets (the whole charge going into one magnet at a time), and the remainder of the cells, through the other commutator, into the second set. The great utility of this arrangement was experienced during the trip, as when all the cells were made use of the boat went at full speed, but when only one commutator was employed, half speed was obtained, and on a long trip the second battery could, of course, be recharged. The motor is capable of making about 900 revolutions a minute, but this in the trial trip was reduced to 400, when the boat went over, with a slack tide, 9 miles in a little more than one hour, a single mile having been accomplished in 7 minutes, and subsequently, when the tide was more favorable, 11 miles were gone over in an hour. A little over two horse power has been registered from only twenty-four cells; and here it may be remarked that Dr. Meldon, who takes an unusual interest in anything that relates to this science, has managed, by a very simple contrivance, to get over the difficulty hitherto experienced in keeping up a continuous light for many hours; that gentleman has had five Swan lamps in his house during the past two winters, and he makes his bichromate cells last twelve hours, by using large zincs and carbons, which at first are only immersed a short distance in the fluid, and then after two hours lowered a few inches more, and so on, using, of course, a larger number of cells than is absolutely required.

It is to be regretted that, owing to the small size of the launch, the battery, which was placed in the forward portion of the boat—eighteen cells being arranged on each side—occupied so much space that there was only room left for four persons to sit with any degree of comfort, and consequently he was obliged to abandon the idea of working his motor with a battery; but, judging by the actual results obtained, he is confident that with *two* storage cells of an accumulator he could easily obtain a speed of over 11 miles an hour.

The advantages claimed for the motor over a dynamo are: 1st. Only one-tenth of the battery power is required to obtain a single horse power. 2d. As there is no dead center it will start instantly, and there is, therefore, no loss of power. 3d. The whole force of the battery passes into one magnet at a time, so that very little power is required. It should be remembered that the launch Electricity had forty-five accumulators of the latest type on board, which were calculated to supply power for six hours at the rate of four horse power, the mean speed obtained having been 9 miles an hour. Dr. Meldon's had only thirty-six cells and did a mile in seven minutes, and it should be noted that the battery was nearly exhausted when this trial took place.—*Journal of Science.*

Sorghum Sugar in Massachusetts.

The practicability of growing sorghum for sugar making in Massachusetts was carefully tried last year by Mr. Henry B. Blackwell, and the value of the cane tested by Mr. S. P. Sharples, State Assayer, in nineteen different experiments, made at frequent intervals from August to the end of December. The season was an unfavorable one for growing sorghum, and this was also the case with sugar cane. Early Amber seed was planted, from Rio Grande, N. J., and from five to seven per cent of sugar and seven to nine per cent of sirup were obtained from the weight of the cane during a period of three months. Fifteen tons of cane were raised to the acre, yielding, by diffusion, over 4,500 pounds of sugar and sirup.

The yield of sugar was less before and after maturity, and in warm weather the cane deteriorated if not worked as soon as cut, though this did not make much difference later in the season, and one sample, cut October 15, and stored in a woodshed, yielded thirty-eight per cent of sirup, said to be "equal to the Porto Rico or New Orleans," at the end of December. These results, on the whole, seem to compare favorably with those obtained with the sugar cane at the South.

The yield of sugar on a 500 acre plantation in the parish of Ascension, La., is reported to average 3,600 pounds to the acre, but the planters this year are complaining bitterly of hard times, protesting against the Mexican and Hawaiian treaties to admit more raw sugars free of duty, and claiming that their industry would be utterly prostrated were it not for the present tariff.

Planters of sorghum for sugar making, therefore, while they may fairly count upon as good remuneration as they would be likely to obtain from other staple crops, if they heed the lessons of recent experience in this line, would be foolish to suppose that this new departure will at once prove a veritable bonanza to them, although, with intelligent and systematic effort, there is every promise of a steady increase in the production of sorghum sugar.

Spouting Oil Wells in Russia.

It is reported that on the 10th of September last a well was tapped at Baku, from which petroleum commenced to spout with a jet 300 feet high, at the rate of two million gallons daily. According to later official reports, the fountain was still flowing at the end of November; and the efforts of the owners to stop it had so far only resulted in checking the outflow to 1,000 tons of oil per day. During November another well at Báku, which has been giving a regular supply since 1874, suddenly commenced to "play," and threw up 500 tons of petroleum every 24 hours. The effect of this sudden outburst is disastrous to the district, pending arrangements for disposing of such a vast quantity of oil. Whole lakes of crude petroleum have been drained into the sea or set on fire, to get rid of the liquid, and the price of petroleum has sunk to 3½d. per ton on the spot.

The great local refining firm of Nobel Brothers have fourteen spouting wells capped over and idle, it being cheaper for them to buy oil than to use their own. This firm announce that by next spring they will be able to distill 75 million gallons of kerosene, and to transport 90 million gallons. As yet the Báku oil has only supplied the Russian, Austrian, and East German markets *via* the Volga; but a new line of railway just opened will convey the product to the southern European markets. It is believed that oil exists over 1,100 square miles of the Baku region, of which only a small area has been bored. The supply is regarded as inexhaustible, and is expected to keep down the value of petroleum oils and spirits in Europe, notwithstanding the condition of the American center of production.

The Artificial Formation of Minerals and Rocks.

Nearly all the interesting researches that have been made in forming minerals by artificial means are due to the chemists and mineralogists of France. Among these none are of more importance than those performed by Messrs. Fouque and Michel-Levy in the formation of various volcanic rocks and minerals through fusion. Recently they have collected their researches, heretofore scattered in several periodicals, in the form of an important volume entitled "Synthese des mineraux et des roches." They employed platinum crucibles incased in fire clay and kept at a high heat for several days, by means of a gas blast. By making use of the principle that minerals crystallize from the fluid magma in the inverse order of their fusibility, and by keeping the melted minerals at different temperatures, carefully chosen, a number of artificial products closely resembling natural minerals and rocks were produced. Thus from a fused mixture of anorthite and augite, plagioclase crystals were obtained by a white heat, kept up for forty-eight hours, and on a second heating at a lower temperature, augite crystals were formed, and the characteristic structure of an ophitic diabase was obtained.

Most of the basic basaltic rocks were thus artificially formed by one or more fusions of a mixture of minerals. The acidic rocks, or those containing quartz, orthoclase, muscovite, hornblende, etc., could not thus be produced. An amorphous or glassy mass was obtained, and the latter minerals would not crystallize out of a fused mass.

The interesting conclusion is therefore reached that granite, gneiss, and other acidic rocks, with their inclosed minerals, are not the result of igneous fusion. This is in accord with the generally accepted belief of geologists, derived from many considerations.—*Amer. Naturalist.*

Be Somebody.

Robert J. Burdette, the facetious editor of the Burlington *Hawkeye*, has been lecturing to large audiences in different parts of the country, and in his amusing style he imparts to the rising generation some wholesome advice. The following is from one of his lectures:

"Be somebody on your own account, my son, and don't try to get along on the reputation of your ancestors. Nobody knows and nobody cares who Adam's grandfather was, and there is not a man living who can tell the name of Brigham Young's mother-in-law." The lecturer urged upon his hearers the necessity of keeping up with the every day procession, and not pulling back in the harness. Hard work never was known to kill men; it was the fun that men had in the intervals that killed them. The fact was, most people had yet to learn what fun really was. A man might go to Europe and spend a million dollars, and then recall the fact that he had a great deal more fun at a picnic twenty years ago that cost him just 65 cents. The theory that the world owed every man a living was false. The world owed a man nothing. There was a living in the world for every man, however, provided the man was willing to work for it. If he did not work for it, somebody else would earn it, and the lazy man would "get left." There were greater opportunities for workers out West than in the Eastern cities, but men who went out West to grow up with the country must do their own growing. There is no browsing allowed in the vigorous West. An energetic man might go out into the far West, and in two or three years possess himself of a bigger house, a bigger yard, a bigger barn, and a bigger mortgage than he could obtain by ten years' work in the East. All young men ought to marry, and no young man should envy old men or rich men. In conclusion, Mr. Burdette said that a man should do well whatever he was given to do, and not despise drudgery.

A Novel System of Contracting.

The method of paying for the work and materials entering into the construction of the magnificent building now being erected by the Mutual Life Insurance Company on the site of the old Post Office, this city—described in our issue of October 20, 1883—is novel, and growing rapidly in favor for structures of this class. The architect, Mr. Charles W. Clinton, thus describes it to a *Tribune* reporter: "Each contractor renders every month a sworn statement of the cost of materials used by him and the amount paid by him for wages. To this is added a percentage, sometimes as low as 8 per cent of the whole, which is paid as contractor's commission. By this method we not only secure efficient work at lower than market rates, but we are enabled to change our plans and make such alterations as we wish in the course of construction, thereby getting rid of the frequent annoyances and disputes consequent on bills for extras."

Further than this, the plan here pursued insures the use of material at least equal in quality to that demanded by the specifications, and unless there be collusion between the contractor and seller, the bills represent the actual value of the materials. This system ought to be agreeable to the contractor, since he is relieved of risk and receives interest on the capital he invests.