fore affords a more favorable *nidus* for vegetable growths, and is consequently less durable. In the case of the bricks, though the red brick absorbs more fog than the Nova Scotia stone, it is a better building material, since it surrenders its moisture with greater facility. The white brick, on the contrary, absorbs less fog than the others, and dries as easily as the red brick; it is therefore the most satisfactory of the building materials submitted to examination.

JOHN C. DRAPER.

[For the Scientific American.]

SOME REMARKS ON PROFESSOR CROOKES' LATEST COMMUNICATIONS.

BY P. H. VANDER WEYDE.

By the kindness of Professor Morton, of Hoboken, I had been furnished the advanced sheet of Professor Crookes' second article, of which an extract appeared in the SCIENTIFIC AMERICAN of November 11th. I was thus perfectly informed of Professor Crookes' latest arguments when I wrote my reply, to certain defenders of the psychic force, published in that same number. I mention this fact only as proof of my quiet convictions of being in the right. I did not refer to it, intending to dispose, in the future, of this somewhat new phase of the subject, and, for shortness' sake, I confined myself to that which had, so far, been brought before the readers of this paper.

As the main points of Professor Crookes' new paper have now appeared, and perhaps been digested by the readers of the SCIENTIFIC AMERICAN, I will consider them in detail, not that I personally consider the subject of such importance, but because the doctrine of the psychic force finds many adherents, whom I think it a duty to save from this novel form of superstition, if such a thing be possible.

Professor Crookes begins with using, as a motto, a quotation from Galvani, in which the latter says that, notwithstanding he is derided by scientists and know-nothings, he knows that he has "discovered one of the greatest forces in Nature." Now this quotation may seem applicable to Professor Crookes, but there are some curious differences and resemblances, which I will first notice. Professor Crookes cannot complain that also the know-nothings laugh at him; they almost all believe in the psychic force, only the great majority of the scientists are incredulous. This is a difference. A resemblance is in the fact that Galvani supposed he had discovered a vital force, a nervous fluid, in short the psychic force, and he attacked Volta and others, most violently, for trying to prove that the contact of the different metals developed an electric current, which caused the motion of the frog's legs, because the latter are, in fact, nothing but a delicate electrometer. Galvani died in the conviction that the cause which moves the frog's legs resides in the frog, and that Volta was in error to ascribe it to an exterior cause; and so Professor Crookes appears convinced that the cause which moves the spring balance resides in Mr. Home, and that others are in error who ascribe it to exterior causes. It has been recorded in the history of scientific discoveries that if Galvani had been posted in electrical science, he would have attributed the first accidental observation of the motion of the frog's legs to its true cause, the induction by the electrical machine, which was being operated at the time in the same room; but being ignorant of the laws of induction, notwithstanding these laws, at that time, were well known and established, he fell back on his old cherished hypothesis that all animals have a peculiar force residing in them; and he was so far from discovering the true theory of these electrical actions, that many well informed scientists, among them Professor B. Silliman, of New Haven, rightly object to the use of the word galvanism, on the ground that Galvani never discovered that which we now designate by that name. It is therefore proposed that Voltaic battery and Voltaic current are the true expressions to be used, and ought to supersede those now in use, which give to Galvani an honor that by no means belongs to him.

The objection was made to Professor Crookes, of rushing into print soon after having made the announcement a short time before of his intention to investigate Home's performances. Professor Crookes answers now that, within two years, he has witnessed experiments of this kind, and that he saw weights of 40 or 60 lbs. so powerfully psychologized that he and others present could scarcely lift them from the floor; that he also saw the gravitation diminished, etc. By this Professor Crookes confesses that he was already a convert to the belief in so called psychological phenomena, and prejudiced in their favor at the time that he announced that he was going to investigate Home's performances.

In regard to the increase in weight of so called psychologized substances, I can speak with full knowledge, having myself often seen such performances; and I must declare that this increase is all in the imagination of the persons trying to lift the weights; their minds were psychologized, that is, so influenced by imaginative persuasion, that their muscles were partially paralyzed. As my faith in the constancy of the laws of gravitation cannot be shaken, my mind could not become psychologized in this way, and I had never any trouble in lifting the weights, and never found any difference whatever, even when a dozen people assured one another they were much heavier than before. However, the best proof I had was to place such a mass in the balance, and challenge the mediums to increase its weight a single ounce; no one ever succeeded in doing this. They pretended to be able to increase or diminish weight, and were sustained by the assertion of many present, but their assertions were never sustained by that most reliable tool of the scientist, the balance.

And this last mentioned peculiarity of the balance must be the crucial task for the reality of the pretended psychic force. The microscope and telescope have often deceived me, the spectroscope is giving me desperate problems to solve, but the balance is the most precious apparatus in my possession, because it always gives direct answers, and has never deceived me. Now, Professor Crookes, as chemist, has surely at least one reliable balance, decidedly more delicate than any existing spring balance; therefore it is surprising that he does not let Home exert his powers on the weights placed in the same, in place of using spring balances, which are so peculiarly apt to be used for deception, that some traders use them exclusively, and in some European countries their employment has been most peremptorily prohibited. In this way he may not only positively prove the existence of the psychic force, but correctly weigh the amount of it to within the tenth of a milligramme; with the balance he may more easily find through what substances this pretended force is conducted; and determine what are conductors and non-conductors of this force or vital fluid, as already appears to have been done in England, by Ziegher, who, six years ago, patented a battery to develop this vital force in large quantity. I am surprised that Professor Crookes is not aware of this important discovery, which is just in the line of pursuit he has now entered upon. He will find it easily in the English patent office records. Mr. Ziegher asserts that it is not electricity, as it passes through bodies which do not conduct electricity, silk being its best conductor. It may be developed independently of the human body, whenever a nitrogenized substance comes in contact with a carbonized body. To produce it he takes a number of bladders filled with liquid ammonia (the nitrogenized substance), and places them in vessels containing molasses (the carbonized substance); these bladders and vessels are connected like a voltaic battery, but by means of silk cords, around the necks of the bladders and hanging in the molasses, in this way: ammonia, bladder, molasses, silk cord, ammonia, bladder, molasses, silk cord, etc.; when now the extreme silk cords are joined, the current of psychic force, or vital fluid, is established, and men or animals placed in this circuit become very lively. This is no exaggeration, as I give the inventor's and English patentee's own words.

In regard to the principal experiments described by Professor Crookes, I will state that I have now arranged the very same contrivance, and am anxious to find a medium who can move it; but I desire psychic action on my chemical balance, produced without contact, to convince me, and then I will as readily reject my old notions, as I have rejected my former errors, which were to believe in the existence of a luminous, a caloric, a magnetic and an electric fluid.

Benefits of Co-operation.

There seems, says the *Nation*, to be a mischievous notion growing up in the minds of some of the European Governments that the International can, and ought to be, put down by force. An attempt of this kind is probably the only thing that could make it permanently powerful and dangerous. But its existence is a symptom, and a striking one, of the tendency of all political questions everywhere to merge themselves in the labor question, and the main result of the work of the International will probably be the rooting in the working class mind all over Europe that this is really the only political question of any moment. A statement was made by Mr. Nutall, a well known leader of the co-operative movement in England, at a recent meeting of the British Social Science Association, revealing a prospect for the laboring classes which makes the schemes of the International and of the "Labor Reformers" very unimportant. He showed that in the manufacturing borough of Oldham, with a total population of seventy thousand, there were co-operative societies numbering seven thousand members. They had a capital of eight hundred thousand dollars in their six co-operative stores, and a hundred and fifty thousand dollars invested in other places. They had built seventy-five workingmen's houses in the last twelve months. They have a corn-mill, large halls, and five libraries, and consultation rooms where they meet weekly for discussion. They have a capital of fifteen hundred thousand dollars, invested in cotton mills and loans; and in one of these cotton mills, which represents a capital of half a million of dollars nine tenths of the shareholders are workmen. A good question for our "labor reform" conventions to discuss would be, how many years of perorating and gadding about the country it would take to produce such results as these.

How to prevent Water from Freezing.

Boussingault relates the following experiment, conducted by him in order to test the condition of water, when cooled considerably below its normal freezing point, under circumstances where free expansion was prevented. For this purpose, a strong cylinder of steel was filled with water at the temperature of maximum density, and a steel plug tightly fitted to the opening, thus preventing, by the strength and the practically unyielding nature of the confining vessel, any expansion of the contained liquid when cooled. The sound made by the falling of a metal ball, previously placed within the cylinder, gave an indication of the condition of its contents. Under these circumstances, Boussingault found that water remains liquid even at a temperature of —18° C. (—0·4° Fahr.), but freezes instantly as soon as the plug, which hermetically sealed the vessel, is removed and the particles are allowed full freedom to expand.

WE hear from Russia that a commission, empowered especially for the consideration of the subject, has recommended the adoption of a narrow gage on the system of railroads about to be constructed between Orenburg and the Caucasus.

Butter Making.

Fine butter is made in various ways; and it would be a public benefit if a uniform rule could be discovered and followed by all in the manufacture of butter. However, this would not render all butter of the same quality, so long as the quality of milk is so different. Breeds of cows, different grasses and other feed, will always continue the difference in milk. Hence we may always expect to find upon the market the different grades of butter usually quoted. The three following modes of caring for milk are principally followed in this State:

1. The milk is strained into pans and set on racks or shelves in the milk room.

2. The milk is strained, and set in pails, in which a small quantity of sour buttermilk is put, to hasten the souring of the milk. When this is sufficiently effected, the milk is churned.

3. In the creameries and many of the large dairies, the milk is strained into pails, about eight inches on the bottom and not far from twenty inches high. These pails are then set into vats differently constructed, into which flows a stream of cold water, which is allowed to rise nearly to the top of the pail and then flows out of the vat, so that there is a constant flow of cold water around the pails. Twenty-four to forty-eight hours is a sufficient time for the cream to rise. It is then dipped off, the cream allowed to stand until slightly sour, and churned. The same process is substantially followed by those who use the large square pan and adopt the cooler system.

Good butter may be made by either of the above modes of handling the milk. But in either case great cleanliness and care are to be observed. Where the pan system is in vogue, the milk room should be so constructed as to admit free ventilation, regulation of temperature, and light. Direct sunlight should never fall upon the milk; neither should a brisk current of air pass over it. Both rapidly dry the cream upon the surface, and convert the surface into a tough, skinny substance, which cannot be converted into good butter.

The cream should be taken off the milk, so soon as the milk is changed or slightly sour. It should never be suffered to remain until spots of mold appear on its surface and whey arises at the side of the pan. Great care should be taken to prevent any bad air to reach the milk room, as both milk and cream rapidly absorb bad air; and where it prevails, good butter cannot be made. The old-fashioned dash churn in some size is best. Churning should be done done slowly, not over forty to sixty strokes per minute; and the milk or cream should be brought to a temperature varying but a little from 62° Fahr. Churning should be thoroughly done. The butter should not be removed from the churn until it is completely "gathered." It should be worked into a solid mass in the churn by the use of the dash; so that, when taken out, there will remain but a small quantity of buttermilk to be worked out. A large majority of dairymen wash their butter, and it is the best practice if you have soft water. Butter should be worked by pressure, whether it be done with the hand ladle or any kind of butter worker. The washing and working should be continued until all the buttermilk is removed. The butter should then be salted. For every twenty pounds of butter, use one pound of sifted, fine dairy salt. Work it carefully and evenly into the butter, and pack immediately.

The practice of salting butter and letting it stand from twelve to twenty-four hours, and then working over and packing, is not only unnecessary, but damaging to the quality of the article. "What is once done well and properly done, is better than twice ill done," applies in this case. The second working renders the butter "salvy." It breaks down the "grain" of the butter- and fits it for grease. Those who have practiced the above mode of working and salting their butter will not go back to the old mode. They say it is the only way they can put down their dairy and feel sure it will come out all right at the end of the season.—*Chenango (N. Y.) Republican.*

Transparent Varnishes.

The aniline colors are particularly well adapted for the manufacture of transparent lacs, which possess great intensity even in very thin films, and are hence very suitable for coloring glass or mica.

The process recommended by F. Springmuhl is to prepare separately an alcoholic solution of bleached shellac or sandarach and a concentrated alcoholic solution of the coloring matter, which last is added to the lac before using it, the glass or mica to be coated being slightly warmed. Colored films of great beauty may also be obtained, according to the author, from colored solutions of gun cotton in ether, the coloring matter being here dissolved in alcohol and ether.

The collodion film has its elasticity greatly increased by the addition of some turpentine oil; and when applied cold, can be removed entire. The colored films may now be cut into any pattern, and again attached to transparent objects.

THE much praised plant *Cundurango* and its juice have already fallen upon evil times. Violently attacked by many members of the profession as a worthless nostrum, the owners are apparently attempting to maintain its character as a quack remedy by offering it to sufferers at $100 per pound, C. O, D., no quantity less than one quarter of a pound being sold. This is making the most of the present notoriety of the drug, and looks as if the proprietors were not anxious for time to extend and justify its reputation.

WHERE manufactures flourish, land and its products are most valuable.

Improved Portable Steam Engine.

We illustrate, in the accompanying engraving, R. Tozer's portable steam engine, to which gold medals were awarded by the South Carolina Agricultural and Mechanical Society, and which embraces in its design many features of merit that well adapt it to the uses to which portable engines are generally applied.

The cylinder is cast in the center of the steam dome, thus avoiding the use of an induction pipe. A hole is cut in the top of the boiler, which admits steam to the dome, the live steam being thus made to entirely surround the cylinder and steam chest, keeping the cylinder hot and preventing condensation therein.

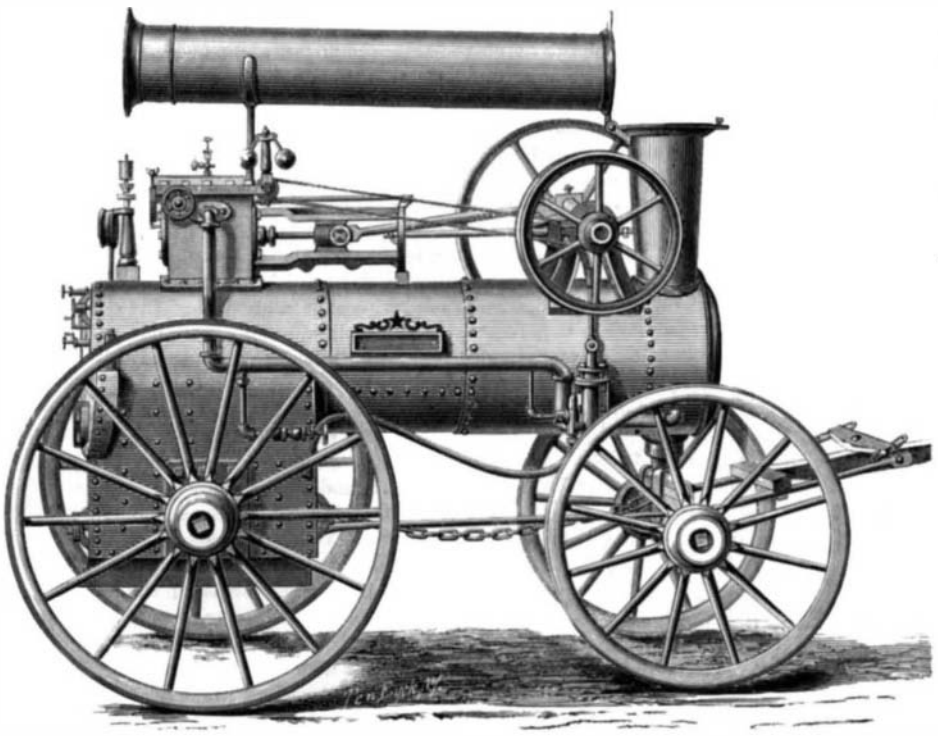
A valve on the side of the steam chest admits the steam to the cylinder, and a plain cover covers both dome and steam chest.

The guides are cast in front of the dome, and bored out with the cylinder.

All parts of the engine are easily accessible, and it is very neat and compact in appearance.

It is stated to operate with great economy, and, having a long connecting rod, it works very easily in its guides.

The engine was designed by R. Tozer, of Columbia, S. C., who manufactures engines of this class, of from four to twenty horse power, and from whom further information may be obtained.



TOZER'S PORTABLE STEAM ENGINE.

Novel Use for Worthless Safes.

The Chicago *Tribune* suggests the erection, in that city, upon the Ball Grounds, of an immense monument to the memory of a number of worthless institutions, late of that city, among which are the various fire insurance companies that proved good for nothing in the hour of trial, the fire-proof safe builders, whose wares failed at the critical moment, the police and fire departments, so sadly deficient in the time of need, etc. Says our cotemporary:

"All over the burnt district the prostrate forms of hundreds of conquered safes are lying, where, having faithfully performed their duties as worthless guardians of property, their ungrateful owners have abandoned them to ignominy. The idea of building a monument from them is novel and unique—more so, perhaps, than the monument itself will be, but we must not grumble at appearances. Henceforth the whole duty of our citizens will be to build every structure cheaply, fireproof, and without regard to appearance. Now, as these safes are utterly worthless—as they always were, only their gulled owners did not know it—the monument will be the cheapest possible. As they have already been subjected to a fierce heat, and have been thoroughly burnt to rubbish, there is little fear that they will burn again. It is true they are of all sizes, patterns, and qualities of badness, and makers and owners will all have a proprietary interest in the struct .re."

A REMARKABLE BOY MECHANIC.

We have on our table a complete working model of a horizontal steam engine with tubular boiler of the locomotive type, separate from the boiler, the workmanship of which would do credit to an experienced mechanic. Every part is stated to have been made by Master C. T. Mason (at the age of fourteen years), of Sumter, S. C. Nothing is omitted, even a miniature steam gage being supplied. Master Mason will, if he continues to progress, be a master mechanic at an age when boys in general have scarcely an idea beyond tops and marbles. He will please accept our thanks for sending his engine for our inspection, and our predictions that, if he lives, he will occupy a distinguished place among the engineers of this country. Few men could beat the execution displayed in his working miniature engine, which, in its details, indicates a knowledge of steam and the laws of its action most remarkable in such a youth. Let Master Mason apply himself diligently to the study of mathematics, mechanics, and drawing, and there can be no doubt of his future. We may add that this young mechanic received a silver medal as a first premium on this model, from the Agricultural and Mechanical Society of South Carolina at its fair of 1869.

Merriam and Dietrick's Lime Kiln.

This invention has for its object to furnish an improved lime kiln, simple in construction, conveniently operated and controlled, and effective in operation, and which will allow the lime to be drawn off as burned, and from the front, side, or rear parts of the flue as may be desired; and it consists in the construction and combination of the various parts of the kiln, as hereinafter more fully described.

The lower part or draw of this kiln, which is built of stone, is about ten feet long, four feet wide, and four feet high. An inclined grate or rack is placed in the rear part of the draw to receive the lime as it falls from the flue. Two heavy plates of cast iron are made with openings in their centers, and placed above the draw and one above the other, at such a distance apart as to receive between them sliding grates or bottoms. The space between these plates is left open at the front and rear, to allow the sliding bottoms to be slid out in front or rear, and one at a time or together, to draw the lime from any desired part of the stack. Sliding dampers are secured to the sliding bottoms in such a way that they may be moved laterally, to partially or wholly enable the draft to be regulated and the fire to be controlled, as may be desired. The stack is of brick, about twenty-four feet high and has a door, in the lower part at the front, through which the lime may be drawn. Either coke or coal may be used in the kiln as fuel, but coke is preferred, as being better and cheaper.

In charging the kiln, about a quarter of a cord of dry wood is put upon the bottom, upon which is placed a layer, about one foot thick, of limestone, then a layer about three inches thick of coal, and similar layers of stone and coal alternately until the flue is filled. The fire is then applied to the wood, and, after being lighted about twenty-four hours, will have burned about ten or twelve feet above the bottom, which becomes cool. As fast as the lime is burned, it is removed and alternate layers of coal and stone added, so that the kiln may be kept burning continuously.

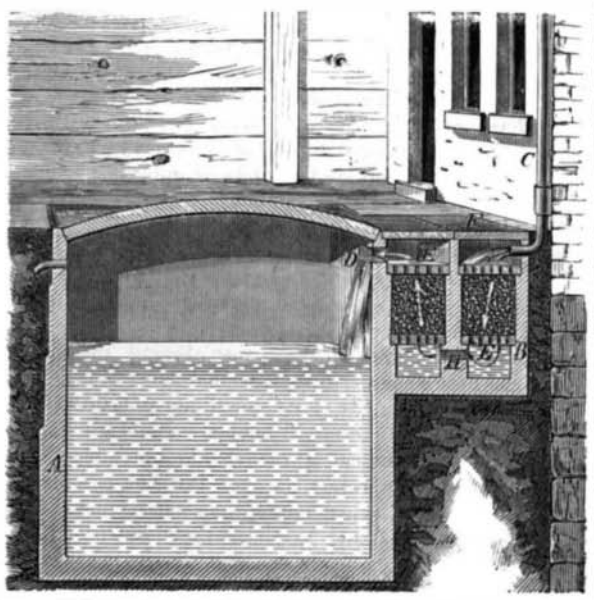
This kiln is the invention of John Q. Merriam and Abram J. Dietrick, of Fort Scott, Kansas

SIMONSON'S IMPROVED FILTERING CISTERN.

Mr. John Q. Simonson, of Graniteville, Staten Island, is the inventor of the improved filtering cistern illustrated in the accompanying engraving.

He claims, as the advantage secured by his invention, that by its use, a perfect substitute for wells is obtained at less cost, while supplying purer water.

The filter is a double one, so that the water is really filtered twice before passing into the cistern for use. It has, we are informed, been on trial for more than three years, preventing any dirt or sediment from being deposited in the cistern. It being an outside attachment, it is easily cleaned out by any ordinary laboring man, and can be quickly re-arranged for use without disturbing the water in the cistern.



The parts, lettered for reference in the engraving, are as follows:

The walls of the cistern are represented at A, the walls of the filter at B, the spout leading from the roof at C, and the exit from the filter to the cistern at D.

Perforated tiles, E, rest upon offsets in the walls of the filter, as shown. The lower tiles are placed sufficiently above the bottom to form chambers, shown separated by a middle partition, these chambers communicating with each other by openings, H. Similar chambers, which do not communicate with each other, are formed above the upper tiles.

The filtering material is placed in the two filtering chambers between the upper and lower tiles, which chambers are also separated by the middle partition.

This filtering material may be one fifth gravel and four fifths charcoal, or it may be all charcoal, or any suitable material preferred.

The flow of the water, as indicated by the arrows, is first into one upper chamber, where it falls upon the perforated tile, which breaks the stream into many small ones, thence it passes slowly down through the filtering material into one of the lower chambers, and from this into the other lower chamber through the openings, H, thence slowly upward through the second filtering chamber into the upper chamber nearest the cistern, out of which it passes into the cistern, purified and ready for use.

In passing slowly through the lower chambers of the filter, the water flows from one to the other through the apertures, H, as described; but as these apertures are at considerable distance from the bottom, there are formed pockets on each side of the middle wall, which serve to collect and retain materials that escape the action of the first filter. The lightest will be retained in the second of these chambers, in which the water ascends with a very slow and gentle movement.

The invention was patented Sept. 10, 1871. For further particulars address Benedict Brothers, 171 Broadway, New York.

The Artificial Volcano.

Dr. Fred. V. Hochstetter furnishes an interesting account of a phenomenon occurring during one of the phases of a manufacturing operation, which is, as he claims, a complete duplicate, upon a miniature scale, of a volcanic eruption, and which serves, at the same time, to confirm the modern views concerning the process of an eruption; according to which the lava is not simply in a molten condition, but is reduced to the state of liquidity by the action of superheated water vapor under great pressure.

The phenomenon referred to occurs in the operation of separating the sulphur from the residual products obtained in the manufacture of soda by Leblanc's process. The sulphur obtained from these residues, in order to free it from the gypsum or sulphate of lime mixed with it, is melted in a suitable apparatus, with steam under a pressure of from 2—3 atmospheres. The gypsum remains suspended in the water, and the fused sulphur is from time to time run off into wooden troughs or forms, the temperature of the fluid mass being about 122° C. (251·6° F.) Almost instantly after the pouring, a crust of solid sulphur is formed on the surface of the mass. Dotted over this surface, however, the orifices are left, from which the liquid beneath is forced up. At intervals a jet of sulphur bubbles out, and cooling, forms around the orifice a slight prominence; the repeated eruptions accumulate material about it, until a miniature volcanic cone is formed, with its crater well defined.

The cause of this curious phenomenon is found in the fact that the sulphur, in its fused condition in the steam chamber, takes up and retains a certain quantity of water; and this absorbed water, it appears, is given out gradually in the in the form of steam, as the sulphur solidifies. The slowly liberated steam, accumulating pressure beneath the crust of sulphur, forces, at regular intervals, an outlet at the vents, carrying with it in its passage the molten material to form the solid cone.

QUINNIPIAC DAM.

The town of Wallingford, Conn., by the almost unanimous voice of its voters, has pledged its co-operation with the community of that place, in the erection of a large dam across the Quinnipiac river, in Wallingford. A three hundred horse power will thus be formed, adding materially, it is believed, to the prosperity of the town.

The Wallingford Community is an association comprising about forty-five members, whose religion and social practices are similar to those of the Oneida (N. Y.) Community. At the discussion of the project in town meeting at Wallingford, while all admitted the material benefits to be derived from the establishment of the water power, objection was made to its consummation on moral grounds. It was alleged that the men and women composing the community were simply a parcel of whoremongers and harlots, to associate with whom, in building the dam, would be a disgrace to the town; and it was asked, now that the Government was endeavoring to extirpate polygamy from Utah, why should not Wallingford rather discourage than encourage the existence in their midst of an association of persons like the Wallingford Community?

This view was promptly rejected by the majority, as having no bearing on the subjects in which the town was most interested, namely, the construction of a large dam across the Quinnipiac, and the consequent increase of manufacturing facilities in that vicinity.

The practical difference between the Wallingford, Oneida, Shaker, and other communist associations and the Mormons, appears to be that the latter live in open, flagrant violation of the laws of the land, while the former are law abiding, faithful people, who somehow or other manage to improve and increase the material wealth of the districts around them. But if their private morals are worse than their neighbors, we hope the home missionaries will not neglect them.

GREAT powers and natural gifts do not bring privileges to their possessors so much as they bring duties.