building stood, and upon which other important and massive buildings now stand, including the massive cathedral of St. Paul's, consists of beds of brick clay of various depths under which lies a stratum of gravel also of varying thickness; and underneath this gravel lies a stratum of stiff blue clay.

The *Builder* states that "through the bed of gravel or beach, penetrated as it is everywhere by water, the engineer of the Thames Embankment has cut a broad and deep trench to the clay below. The foundations of the granite quay wall rest on this geological rock, at the depth of 32 feet 6 inches below Trinity high water mark. To excavate and to keep clear these foundations, a steam engine of fourteen-horse power was in each section constantly at work, and the chain pump which it propelled, discharged a perfect river from the subterranean source. The flow of water thus caused would not desist from exerting its own mechanical influences, out of respect for the Lord Mayor, or for any of the officers, institutions, or buildings of the city of London. What the natural effect of this mighty pumping would be in theory, we all know. Gradual loosening of the permeable stratum, displacement of the smaller particles, consequent tendency of the larger ones to come down together, disposition of the whole water supplying area to move microscopically, infinitesimally it may be, but still with mathematical certitude. As to this there could be no doubt, although we had small thanks for saying so fourteen months ago.

"One point might have been considered doubtful, and that was how far the weight of any massive building compressing and consolidating this adjacent gravel, might have prevented the mischievous action of the infiltration (or rather, if there were such a word, exfiltration) of the water. On this point we have now not only information, but a flood of light, and a very unpleasant flood into the bargain."

How far the same cause which produced the disaster alluded to will affect other more important structures remains to be shown. Certain it is that eminent architectural authorities have predicted further calamity unless the most prompt and skillful measures are applied to their prevention. The embankment has stopped where it is, and precautionary measures in the provision of tie-rods, etc., have been made to such structures as show signs of having been injured.

TEST OF TURBINE WATER WHEELS AT LOWELL, MASS.

Whether a competitive test of anything can at this day be conducted anywhere under the shadow of the wings of the American Eagle in such a manner as to enlighten the public as to the merits of the thing tested, becomes annually more and more doubtful. To implicitly cling to such a faith in the face of two events of this kind which graced, or disgraced—which you will—the year 1869, argues such a trustful spirit on the part of the possessor of such a blind faith, as must certainly render him the most unsophisticated of mankind.

The two events referred to are the tests of steam-engines at the late fair of the American Institute, and the test of turbine water wheels at Lowell, Mass. The announcement of the latter in this journal last June, aroused more attention in the American mechanical public than any other event of the year. Not only ourselves, but Mr. James Emerson, whose dynamometer was employed to test the power of the wheels, were flooded with inquiries concerning it. Mr. Emerson states that the publication of this announcement "decided two points conclusively: first, the extensive circulation of the SCIENTIFIC AMERICAN, and second, the immense interest felt throughout the country in regard to the test." He says: "I have received letters of inquiry from the most out-of-the-way, unheard-of nooks and corners, from every State and Territory in this country, also from the British Provinces."

We wish that we could now say that the test had proved something as well as the announcement. The latter it seems proved two interesting and important facts; but, so far as we can learn, the test either has proved nothing, or it has proved what the parties interested do not care to publish.

The public was invited to attend this trial, and it was generally understood that it was to be conducted in an open and fair manner, and a report made in detail describing the construction and peculiarities of each wheel; if they were made of metal, and if so what kind; if they were finished better than those ordinarily made and sold, or if taken promiscuously out of the stock of the manufacturer. In short, to render the publication of a test of this kind of any practical use or interest to the public, all the conditions under which it is conducted must be known. We have received from Mr. Emerson a report of the result obtained by each wheel, but it is very meager and not by any means complete. Simultaneously with its receipt, our editorial mouth is stopped by the receipt of letters from different exhibitors, warning us against its publication, and stating that it is unauthorized. Writing in this dilemma to Mr. H. F. Mills, of Lawrence, Mass., who conducted the tests, and has, we believe, some reputation as an hydraulic engineer, and who is stated to be the only person authorized to make a report, we learn from him that the public were only invited to witness the test of a *single wheel*, and that a full report upon all the wheels tested will not probably be given.

This being the case, we find ourselves sufficiently human to rejoice in the statement of Mr. Emerson to the effect that, before the Lowell test closed, he went West to test a new wheel, which gave better results than any wheel tested at Lowell, and which will be brought to the East next season to compete with any or all of them. We hope this may be so; but really we find it a difficult matter to believe reliable tests will be made, or that if the tests should be reliable, that the reports will be. We wait with some curiosity to see how the new-comer will come out.

BLACK RIVER FLOOD CASE.

A case of more than usual interest to civil engineers, involving important hydraulic questions, has been pending before the State Board of Canal Appraisers for several months, and is now completed, as to the testimony, and the issues of claim and defense.

In April, 1869, a large reservoir, built by the State in 1856, at the head sources of the Black River, as a feeder to the Black River Canal, was carried away during a spring freshet. A large amount of property was injured by it, along the upper portion of the river; and claims for damage have been made along its whole line, or about 100 miles. The case is tried under a special law of the last session, and involves about $750,000 aggregate damages.

The theory of the claim is, that the State has been negligent in the construction and superintendence of the reservoir, and in consequence of this negligence the damages occurred; for that portion of the damages at and below Carthage, a point about 73 miles below the reservoir, the claim identifies the reservoir rupture as the cause.

On the other hand, the Counsel for the State aver that the rupture occurred during an unprecedented flood, which no engineering skill could have provided for, and that the reservoir rupture did not have sufficient time and power to cause the damages claimed below Carthage.

The Counsel more directly engaged were the Hon. C. H. Doolittle, of Utica, with Messrs. C. A. Sherman and J. T. Starbuck, of Watertown, for the claimants; and Messrs. L. H. Brown, of Watertown, Samuel Earl, of Syracuse, and Chas. Rhodes, of Oswego, for the State. The issue having been mainly dependent upon hydraulic principles of construction and action, the expert witnesses were Hon. W. J. McAlpine and Chas. H. Haswell, Esq., associated with Samuel McElroy, Esq., by whom the case was specially investigated on the part of the claimants; and Messrs. D. Greene, and L. L. Nichols on the part of the State, the latter having been more particularly identified with the case.

As part of the testimony, Mr. McElroy submitted an elaborate analysis of the case, discussing the questions at issue as to the construction and care of the reservoir, the theory of its rupture, and the descent of its flood to Lake Ontario. In this paper the several elements which control the action of the freshet and the descending flood, the topography of the river, drainage area, history and several states of the freshets, testimony as to times and extent of damage, and principles of flood-flow are fully treated, and furnish a large amount of information on a subject not often presented.

The point, however, in the case, which is the most prominent, is the development here on a large scale, of the theory and action of the "wave of translation," which has been the subject of much elaborate investigation by scientific men, but is, so far as now known, first introduced here in a legal case, as a direct cause of serious damage. During the trial, the theory presented by Mr. McElroy and fully indorsed by his associates, was emphatically confirmed by the celebrated English engineer, J. Scott Russell, Esq., who was consulted at Paris, and who is identified with various elaborate investigations of this hydraulic law.

It appears that for nearly one third the length of the river and about its center, there exists a long, wide, deep basin, which in powerful freshets is filled to a great depth, averaging in this instance, about 24 feet, three fourths of a mile wide, and thirty miles long, on a central line.

At the head of this basin or "pool" there is a high fall, called Lyon's Falls, of 70 feet in low water, and about 54 feet in freshets; the hydraulic slope to the Carthage dam being about 26 feet, on the 30 miles.

The theory of these experts is, that the main portion of the reservoir flood plunging over this fall, into a deep basin, discharging, as estimated, about two thirds of 560,000,000 cubic feet of water in six hours, and capable, in all, of displacing about 4½ miles of the upper section, displaced at the lower end of the basin an equivalent body of water, some time before its actual particles could reach Carthage, in the time determined by the laws of the "wave of translation" or "displacement swell," as Mr. McElroy here designates it.

This analysis, in discussing the "principles of flow," shows that, while certain laws of hydraulic motion have been so thoroughly investigated, as to be "implicitly trusted," circumstances occur in flood movements which modify these laws. This general theory is then illustrated by examples from "confluent streams," "overfall weirs," and "submerged weirs," and the experience on the large aqueducts of the country. The paper then proceeds:

"In the upper valley of the Black River, we find the wave traveling with an advance 'bore,' which may or may not have been preceded by a more quiet sheet of water, the rush being distinctly marked at various points; from Dawson's to Bellingertown, and from Forestport to the Lee Bridge, the observed speed approximates to about one half the calculated central velocity; in the lower valley, similar phenomena of action were observed, the 'bore' being distinctly defined on the Carthage dam, at Rason's, Great Bend, and other points.

"In the long reaches, however, and the pool, the descending wave could not take possession of the channel, from the mass of more quiet water it successively encountered, and a different principle of relief is brought into action, by which mechanical impulse is transmitted in advance of actual molecular movement.

"The investigations of science have determined that all liquids and fluids have certain analogous laws of motion and action, and in the movement of light, sound, electrical currents, as also in water, action is frequently most perfect where actual movement of particles is impossible in the same degree. Nature has provided this wave action as a means of communication, which does not involve actual molecular delivery, in those cases where such delivery is inadmissible."

* * * * * *

Various examples are then cited; the experiments and deductions of Scott Russell are given; and the remarkable confirmations of the Hudson River and Long Island Sound tidal waves are described, with this application:

"Now this flood-wave mass was entirely able to sweep down the River Channels of Lyon's Falls, because it found a comparatively free path to travel in, and its whole body in the main, did so pass down; but when the 15,654,000 gross tuns of water, which represent it, plunged over the Lyon's Falls' dam with an impinging velocity of 58 feet per second, a comparatively quiescent body of water, more than seven times its weight, was interposed against its free progress further. According to the laws and examples we have cited, two distinct results followed: one, the displacement of a portion of the pool, equivalent to this falling body, at the other end, by the action of the "displacement swell;" and another, following as an inevitable sequence, was the increase of the former current of the pool towards Carthage."

It is then shown by applying D'Aubuisson's formula to this case, that the time of transmission of motion to Carthage through a basin of this depth is two hours, and the observed accelerated current is between six and eight miles per hour. Various phenomena which corroborate this action, are also cited.

The conclusion, identifying the reservoir flood with the progress of damages along the river, and confirming these calculations by a series of observed facts, is thus given:

"At Dexter (the river mouth), Parker, by 7 A.M., the 22d (April), records accumulated damages; at Watertown, shortly after 5 A. M., serious damages occurred; at Great Bend, by 2 A. M., there was a rise, 3 feet to 3 feet 9 inches, above level of 1862; at Carthage, about 1 A. M., the rush over the dam had swept away a stone wall, and other damages were done that night, doubtless by the same means; at Lyon's Falls, the great reservoir wave struck the pool, then at a stand, certainly by 10 P.M., with a probable advance before this; at Port Lyden (3½ miles above) the corrected testimony makes it plain that this advance may have passed at 7, that the 'bore' passed about 9, and that the full crest swept through at midnight. This forms a chain of evidence which fully accords with the deductions of science, with observations of the highest importance in other localities, and the testimony of localities all along these 70 miles, which differs only in minor details. It is impossible to escape from the conclusion which identifies these events with the same powerful cause, all the more destructive as riding down its successive descents on the fully prepared water way of a powerful freshet, without which it would have been shorn of a great part of its power and swiftness, and whose volume it gathered up and hurled along on its resistless path."

During the trial, an experiment was given by Mr. McAlpine, with a narrow trough about 8 feet long, filled with clear water, the lower part being then charged with blue coloring, and the upper part supplied with red colored water. This illustrated with great exactness, the law of displacement, long before the upper supply reached the lower ledge, and also illustrated the relation between the power of the upper supply and the lower delivery.

All the details of this case involve important principles, which will make a precedent for similar issues hereafter.

FOREMEN AND SUPERINTENDENTS.

The qualities which are essential to a good foreman or superintendent of a manufacturing establishment are rarely all combined in a single individual. When they are not naturally possessed in a high degree, they may, however, be so developed by education and self-discipline as to, in a great measure, supply natural defects. Such education and discipline, however, must, to be successful, be early commenced; and as doubtless many young mechanics who peruse these columns are aiming to qualify themselves for positions of trust and command, it may not be amiss to discuss briefly the qualifications of a first-class foreman and superintendent.

We do not regard it as absolutely essential, though, if possible, desirable, that the foreman of an establishment should be able to perform himself all the various operations, as conducted in it. It would be in many cases almost impossible that should be able to do this, but he ought to be able to determine when these operations are performed unskillfully, so that he may himself instruct, or select subordinates who are competent to instruct operatives how to do their work in the best manner.

In many large manufacturing establishments, and in all large manufactories of textile fabrics, the general supervision is vested in a manager or superintendent, while the different departments are supervised by foremen acting under, and by the authority of the general manager. It is impossible that all the operatives in such establishments should be skilled in their work. Many of them will be of necessity apprentices or learners, and as such will stand in need of direction and instruction. One of the duties of a foreman must therefore be that of an instructor, and an important and responsible duty it is, requiring for its proper execution, patience, power of imparting information with clearness, perception, not only of defects in work, but in the peculiar deficiencies of hand or mind which are primary causes of unskillfulness. And he must not only be able to detect, but to devise readily remedies for such defects where remedies are possible.

Of all the means by which instruction can be readily imparted, especially in those departments of the mechanic arts where skill is required to fashion crude materials into a great variety of forms, there is none of greater value than free-hand drawing. A few strokes with a piece of chalk or a lead pencil, performed by a trained hand will often do more towards imparting a clear idea of what is desired than an hour's talk; and a sketch of this kind has moreover the advantage that it can be left as a permanent guide, when mere oral instruction would be forgotten, and require repetition. Such sketches are for many purposes as good as more elabo rate drawings; but the good foreman ought also to be able to prepare these when required. Without more or less skill in drawing there will always be more or less difficulty in the interpretation of drawings, and a good foreman ought never to be at a loss to do this readily and accurately when drawings are properly prepared.

We cannot too emphatically urge upon all young mechanics the importance of the early study of drawing, if they are ambitious to rise in their profession.

A foreman should be able to systematize labor and distribute it to the best advantage, so that the largest results shall be obtained at a minimum cost to his employer; and while able to enforce discipline, he should also have the faculty of conciliating and commanding the respect and good will of those under his charge. To do this, he must cultivate habits of self-restraint, a love for justice, and due regard for individual rights. He must be firm without being obstinate, decided without arrogance, and capable of administering reproof without loosing control of his temper.

Finally, he should be well informed in all facts immediately or remotely pertaining to the industry which he assumes to direct, and should keep himself thoroughly posted in current information pertaining to it. With such qualifications success cannot fail to attend the efforts of any superintendent or foreman who possesses the other essential of a business man—industry and integrity.

DIVING AND DIVING APPARATUS.

No operation in submarine engineering is more important or attended with greater personal risk than diving. This art has, however, been so far advanced, and apparatus for diving has been so far perfected, that divers now descend to depths of over one hundred feet, and not only remain there with impunity, but actually perform work. It seems sufficiently marvelous that human beings can, without performing any useful work, remain at such extraordinary depths, not only carrying upon their persons an armor which weighs one hundred and forty pounds, but subjected to a pressure of nearly nine atmospheres; but when we reflect that under such trying circumstances, the diver is frequently called upon to perform operations of considerable nicety—as, for example, leveling—the feat becomes one far more wonderful than an ascent into the air by the most daring aeronaut.

In an aerial voyage the passage is made through an element congenial to animal life, and in the broad light of heaven. The body is unencumbered, and perfect freedom of movement exists in an emergency. In diving all these conditions are reversed. The descent is made into an element inimical to life; into isolated depths where the light of day does not penetrate, and where the mighty weight of water grips as in a vise, frequently benumbs, and renders more difficult the use of the already encumbered limbs.

Only individuals of peculiar temperaments can withstand the effects of great pressure in diving. A person of full habit would generally be attacked with bleeding from the lungs. His head would snap and ring with strange noises, and his copper helmet, with its little plate-glass windows, would be illuminated with more stars than Lord Ross' telescope reveals in the milky way. Individuals of the lean and hungry kind, provided their viscera are all sound, can undergo such compression with the least risk.

There are about thirty professional divers in the United States, and the annual mortality has been on the average about four of this number.

Such risks are, of course, taken only under the stimulus of high wages. The compensation of expert hands is four or five times that obtained by the same class of men in other occupations. The necessary risks are, however, sometimes increased by the reckless habits of some divers. The gang of men employed by Mr. Geo. W. Fuller, of Norwich, Conn.—one of the most scientific and accomplished divers in this country—which has been selected with great care, has never met with any fatal accident.

This is not, however, to be wholly attributed to the careful selection of men, but is also, in great measure, to be ascribed to the extreme perfection which Mr. Fuller's experience and skill have imparted to the apparatus employed by him. This gentleman has made diving a special study for years, and being gifted with great inventive talent as well as superior mechanical skill in executing his designs, he has yearly applied the experience of a large practice, in submarine engineering, recovery of property from wrecks, surveys of marine bottoms, etc., to the improvement of his apparatus.

He now employs a four-cylinder air-pumping engine to supply air to the submerged divers, which in beauty of finish, accuracy of workmanship, and perfect freedom from all possibility of leakage, we have never seen equaled. The packing of the plungers, while pressing against the walls of the pump cylinders so lightly that any plunger will descend by its own weight, is still so absolutely tight that not the slightest leak can be detected under the heaviest pressures.

This packing is the invention of Mr. Fuller, who has also made great improvements in the shoes worn by divers. These he now makes with toe caps of bell-metal, and the edges of the soles and sides of the shoes are also protected by the same material. The soles are weighted with lead, the bottoms being also armed with the bell-metal to protect them from wear. These improvements render the shoes far more durable and serviceable than the old style.

The attachments of the weights to the back and front of the armor have also received their share of improvement, which renders them much more secure and more quickly performed.

The lantern is a beautiful piece of workmanship, and we shall not attempt a minute description of it. It is fed by air from the surface precisely as the diver's lungs are supplied by an air tube from the pumping engine above. In descending its flame becomes brighter and brighter, until at the depth of a hundred feet it glows with the whiteness and brilliancy of the calcium light. This result is attributable to the condensation of the air, which increases the amount of oxygen contained in a given volume.

The hoisting apparatus has also been so far perfected by the efforts of Mr. Fuller that it is now generally adopted by all the heavy wrecking companies in the country. The Coast Wrecking Company assert that this machine has never yet found its equal.

It is safe to say that the advancement in the art of diving achieved by Mr. Fuller could only have been accomplished by a man combining the practical experience of the diver, with intelligence and skill as a practical mechanic.

So far as we are aware, he is the only man in the country who combines these requisites. Every part of the apparatus employed by him has received the closest study, and a minute of any suggestion arising from new exigencies or requirements in practice is always made on the spot where it occurs for future careful consideration. In this way Mr. Fuller has accumulated a large mass of interesting information upon which we have liberally drawn for the substance of this article. At some future time we may return to the subject, which cannot by any means be exhausted in a single article.

TUNNELS VS. BRIDGES.

The East London Underground Railway is now running its trains regularly under the Thames river through the celebrated Thames Tunnel. This gigantic work was constructed at an expense of $4,000,000, greenbacks; and although originally designed for an ordinary carriage way, such is its massive character that it was found strong enough to support the heaviest locomotives. The length of this tunnel is 1,200 feet; the hight of exterior walls, 38 feet; width, 22½ feet. Two tracks are laid, and the running of the trains gives great public satisfaction.

In the face of such a successful example of subaqueous railway, which is an improvement of the most unquestionable character, always solid and secure, we behold the public spirited men of New York and Brooklyn at this moment engaged in trying to establish communication between these great cities by means of a single span suspension bridge, which, to say nothing of the immense cost and years of labor involved, will never be free from danger of falling, and can never satisfy the public wants. Every storm that blows will try its foundations; every change of temperature will weaken its wires.

The tunneling of the East River is just as practicable as the Thames. A strong and capacious tunnel can be built between New York and Brooklyn for less money, and in less time, than the suspension bridge; and when the tunnel is complete, nothing short of an earthquake can impair its safety.

Gentlemen of the bridge, we advise you to get an amendment to your charter; convert your caisson excavation into a well, from which to bore a tunnel under the river. Your bridge, if ever built, will be a monument of your stupidity in adopting the poorest method of communication, when you might just as well have selected the best—to wit, the tunnel.

WHAT IS SAID OF OUR PRIZE ENGRAVING.

We have sent out large numbers of premium engravings to those who have succeeded in getting up clubs in accordance with our terms; and it is gratifying to us to receive so many testimonials of its high quality as a work of art. We make a few extracts from letters of our correspondents, showing how they appreciate the picture.

E. L. Keeler, of Allegheny, Pa., writes as follows:

"With the greatest thanks, I take the earliest opportunity to inform you that I have received the beautiful engraving you sent me. I and my family prize it very highly. It is an engraving that every American citizen should have. It should adorn the walls of the most humble cottage. Such a group of benefactors cannot be too highly prized. Think of the thought, meditation, trials, and privations that most of these men have passed through, and the thousands now blessing what their genius has given to the world; then say who would not be proud of such a prize. I received my papers; the members of my club are highly pleased with them also. I enjoy reading them very much."

J. S. Atkinson, of Ormsby, Pa., who has already received four copies of the engraving, writes as follows:

"Please inform me how many further additions to our list would entitle us to another copy of 'The American Inventors,' and further, how many additional would entitle us to two copies? We admire them so much that we desire to procure one or two for complimentary presentation."

Henry Wheeler, of Silver Creek, N. Y., says: "'Men of Progress' reached me safely. It is a beautiful picture." Alonzo D. Lamson, of Shelburne Falls, Mass., acknowledges the safe arrival of the picture, and says "I am much pleased with the picture." F. W. Sinclair, of Mottville, N. Y., says: "The premium picture reached me in perfect order, and fully repays me for the time spent in getting a club, to say nothing of the satisfaction of introducing your valuable journal to so many of my neighbors."

We shall continue to offer this splendid engraving as a premium for clubs, at our publication rates, or if any single person wishes to procure a copy, he can do so by remitting $10, which will also entitle him to a year's subscription to the SCIENTIFIC AMERICAN.

The Atmospheric Germ Theory.

In a lecture upon the above subject by Joseph Liston, F. R. S., Professor of Surgery in the University of Edinburgh, he gives the following interesting account of one of M. Pasteur's experiments, which proves that the gases of the air cannot of themselves occasion the growth of organisms even in a very favorable nidus for their development; and also that, in the regions inhabited by plants or animals, whether in cities or in the country, each cubic inch of atmosphere really does contain living germs floating in it. "A flask was prepared having its neck not only drawn out into a pretty narrow tube, but bent at various angles. The fluid is then boiled as in the former experiments; but the end of the neck, instead of being sealed, is left open, so that air passes into the flask on withdrawal of the lamp. The vessel being then left undisturbed, the diurnal changes of temperature, involving alternate expansion by day and condensation at night of the gases in the flask, necessitate a daily interchange between the air in the body of the flask and the external atmosphere. Yet the fluid, though exposed in this way to air perpetually changed, remains for an indefinite period quite transparent, without trace of organic development. There can be but one interpretation of this fact. The oxygen, whether in its ordinary condition or that of ozone, with all the other atmospheric gases, including many which may exist in such small quantities as to be undiscoverable by the chemist, must pass, each in its own proportion, unchanged into the body of the flask. It is impossible that a dry glass tube, can stop any gas. For, though the tube is moist from condensation of aqueous vapor in the first instance, it is soon dried by the air that passes in and out through it. It is therefore inconceivable that any atmospheric gas can have been arrested by the tube. But it is conceivable, considering the very gradual character of the movements of the air in consequence of the diurnal changes, that dust, even though very fine, may be arrested by the angles. We may perhaps wonder that particles of such extreme minuteness as the germs of atmospheric organisms should be so detained; but no one can say it is impossible, and no other possible explanation presents itself. The experiment proves with certainty that the gases of the air, however abundantly supplied, are of themselves unable to originate the growth of torulæ and other minute organisms which appear in a decotion of yeast freely exposed to the atmosphere, and also that the essential source of such development must be suspended particles or germs. But in order to render the experiment, if possible, still more conclusive, the committee of the Academy completed it by sealing the end of the flask after the fluid had remained clear for a sufficient length of time to show that no organism could grow in it, and, inverting the flask, shook it until some of the liquid passed into the angles of the bent tube, after which the vessel was again left to itself. And now, occurred something which you may perhaps be disposed to regard as too good to be true, but which is true nevertheless. In the course of no long time, the fluid in the angles of the tube exhibited indications of organic growth, demonstrating that the sources or germs of of such development had, as a matter of fact, been arrested there."

Successful Experiments With a New Explosive at the Hoosac Tunnel.

Capt. Von Schelika and Lieut. Von Dittmar, both of the Prussian army, and the latter the inventor of the explosive known as "dualin," have been giving a practical illustration of its quality at the Hoosac tunnel, which has proved very successful. The experiments included trials of its power upon rocks, simply placing a few ounces on the surface and covering it with dirt—upon a boulder in the open field, the hole being drilled in the usual way and the dualin lightly "tamped" in, and in the regular work of the tunnel, at the west and central shafts. In every instance the explosive did all that is claimed for it, and proved itself a most powerful agent for breaking things. The same weight of the dualin is more effective than nitro-glycerin, while it is also considerably cheaper, and absolutely safe in the handling. Its obvious advantages over nitro-glycerin are so great that a considerable quantity of it has been ordered already, and it is probable that it will soon be exclusively used by the Messrs. Shanly in their work on the tunnel. Its great advantage is in the safety with which it can be used, even allowing for accident or carelessness. While possessing many of the properties of nitro-glycerin, it is so prepared and combined with other substances as not to be exploded by concussion—indeed, when not confined and fire is applied to it, it does not explode, but simply burns. Lieutenant Dittmar brought over with him, from Germany, 100 pounds of dualin in a carpet-bag, and we are sure he would not have treated nitroglycerin in that confident manner. There have already been numerous fatal accidents from nitro-glycerin, at the tunnel, and any explosive that will be equally effectual, and yet safe to handle, will be a real boon to the workmen, if to no one else.—*Springfield Republican.*

COFFEE HULLING.—H. H. Houghton, U. S. Consul at Lahainee, Sandwich Islands, wishes to obtain some information about machinery for taking off the outside pulp from coffee, and also for taking the inside hull from the berry.