Port Arthur.

Mr. H. E. M. James says: Hunchun and the northern garrisons of China are all of small importance when compared with the great military and naval station of Port Arthur, situated at the extreme south of the province of Manchuria. This place has been established to oppose, not one European nation in particular, but all, and it may be said to represent the net outcome of the recent efforts the Chinese have made to adopt European methods and appliances of war and to imitate their system of defense. It is here that the Chinese government consider they have created a first line of defense against the powers of the West, and it must be admitted that a naturally favored position has been rendered the most formidable military station in the empire by the efforts they and their European advisers have bestowed upon it. Mr. James writes:

The hills to seaward are crowned with a series of forts, thirteen in number, armed with very powerful Krupp guns, and manned by artillerymen, who are drilled and instructed by . . . . a German officer. The garrison consists of 7,000 foreign drilled troops, armed with the Mauser rifle, and there are field batteries besides. During the war with the French 25,000 men are said to have been massed at this place, which is in communication by telegraph with Newchwang and Pekin. The hills on the landward side, which have not yet been fortified, are covered with barracks, magazines, and other offices, all connected by telephones, and on the far side of all lies the native bazar. A graving dock and a refuge dock are now under construction, at an estimated cost of £250,000 sterling. On the eminence overlooking the entrance of the port an electrical search apparatus is mounted to illuminate the sea and prevent an enemy approaching under cover of darkness. There are factories for submarine mines and torpedoes, with a supply of torpedoes in stock; in fact, Port Arthur is like a good suburban villa—fitted with the latest modern improvements.

Gas Works in a Cold Climate.

In the discussion of a paper read before the recent meeting of the American Gas Light Association, Mr. J. F. Scriver said: I happen to be one of the unfortunate fellows who live in a cold country—Montreal. I do not know that we get down to 36° below zero there, but we very often have it at zero, which is quite cold enough to be comfortable. We have a great deal of trouble, as you have heard, from the extremely cold weather of our northern climate.

The greatest trouble which we experience is the trouble with capital. We require at least double the capital to construct gas works in Montreal, Quebec, or Halifax that you need in New York, Brooklyn, Washington, or any point about there. We have to put our pipes down to a very great depth in the ground. We lay our pipes with a covering of at least 5 feet. We find that it is not safe to have them any nearer the surface than that. We have to construct over all our machinery very expensive buildings. I wish that we could run our gas holders in the open air, as they are represented in the pictures which are exhibited here. But we cannot do that, and we have to put up very expensive buildings, with costly iron roofs over them. We have to cover in our purifiers and condensers, and all the machinery that we have has to be thoroughly housed. We have not only to keep them covered with buildings, but we have also the additional expense of keeping them warm and keeping everything from freezing. It would not do for us to allow the gas holder to freeze, and, therefore, we have to keep an immense space heated. With regard to the freezing of pipes, I may state that in Montreal we have on more than one occasion found our pipes frozen solid for at least 100 feet. Then with the temperature below zero, we have to open the ground, expose the pipes, and thaw them out, and the only way to get the frost out of the pipes under such circumstances is to build coke fires upon them, and it is rather a strange sight in the middle of winter to see about 100 feet of ground open, filled with hot coke, burning away night and day for three or four days, until the frost is removed.

Another difficulty with which we have to contend is that bugbear naphthaline. The cold weather makes naphthaline very readily. Our greatest difficulty, however, is not in the extremely cold weather, but when the winter sets in. We are not troubled with it very much about our works, but outside of the works for a distance of half a mile is where we get the most. We do manage to keep the naphthaline out of our works, but when it travels from cold pipes to pipes that perhaps lie in low damp ground, the naphthaline accumulates to a large extent, although I am happy to say it has not troubled us to the extent that it seems to trouble people in Hamilton at the present time.

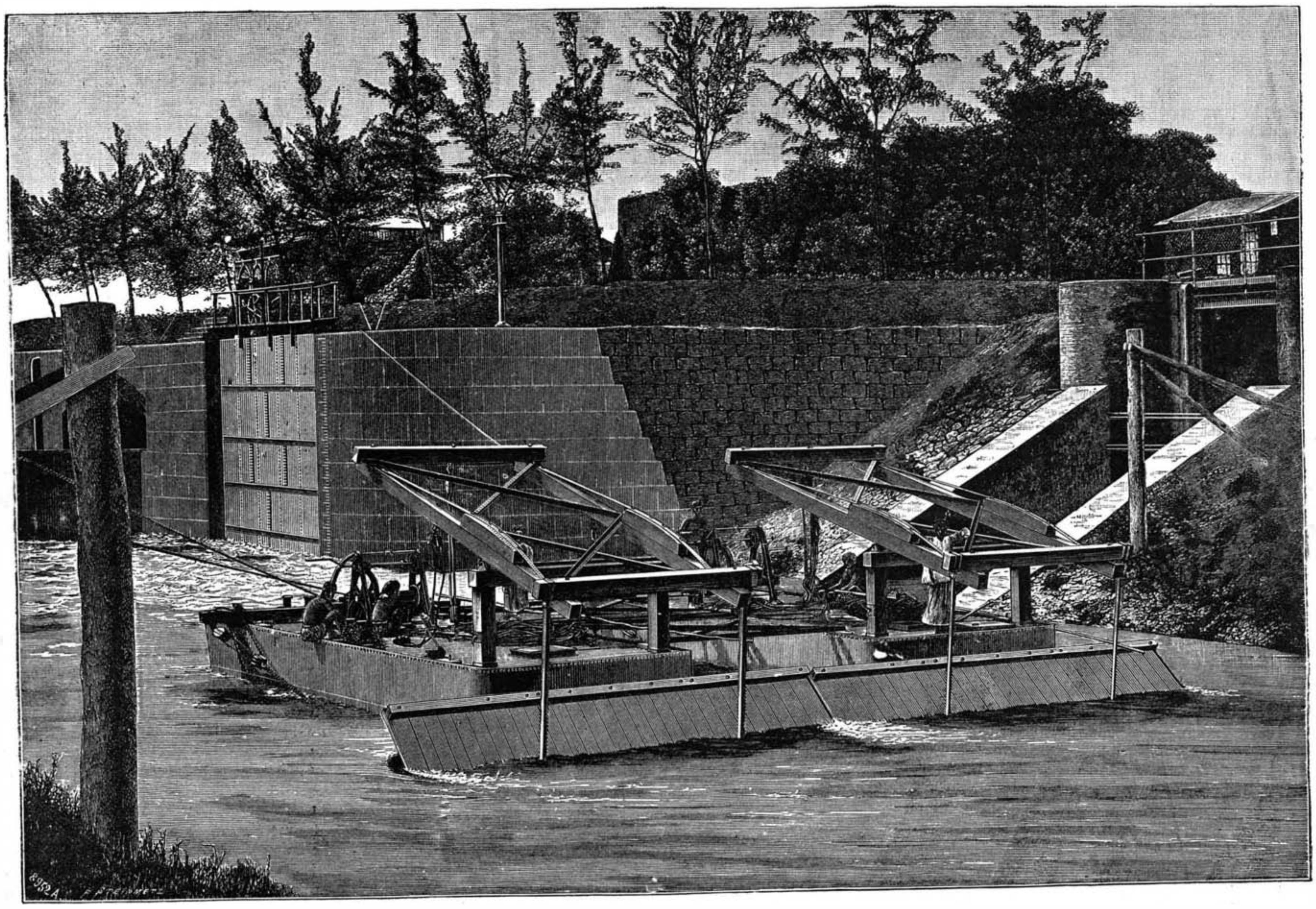
Another additional expense (and I refer to it because it requires additional capital) is the furnishing of buildings for the storage of our coals. Our American brethren get their supplies of coals in daily, I presume, as they want them, but in Montreal we have to store 35,000 or 40,000 tons of coals for our winter's supply. Therefore we have to purchase a great deal of ground on which to erect our shed. We do not pile our coals high in Montreal. We find that we cannot pile our coals more than 6 feet or 7 feet high. We build our sheds with open sides and with the roof sustained by iron columns, so as to allow a free circulation of air, and you can readily understand that it requires a great deal of ground to pile up to a height of 6 feet or 7 feet 40,000 tons of coals. This is absolutely necessary with us, because we have not railroad communication with the mines, and have to lay in a sufficient supply in the summer season.

IMPROVED FLOATING SCOURING DAM.

This apparatus was devised by Mr. John Kingston, for clearing away silt deposits from rivers by the action of the current intensified and directed upon the bottom by the obstruction of the dam.

Mr. James Henry Apjohn, a canal engineer in India, has applied the apparatus for keeping clear of silt the channels 200 feet to 300 feet in length between the canal locks and the tidal rivers with which they connect.

The water of these rivers is for the most part very full of silt, which rapidly deposits in the back water of the lock channel, and to such an extent does this silting up in many instances take place, that the bed of the channel is often as much as 8 feet to 10 feet above the lower sill of the lock, which consequently can only be entered by boats at or about high water. There is generally plenty of water for scouring purposes available from the canals, but merely letting it run out through the silted-up channel during the time of low water was found to have but little effect until Mr. Kingston's scouring dam was brought into use.



IMPROVED FLOATING SCOURING DAM.

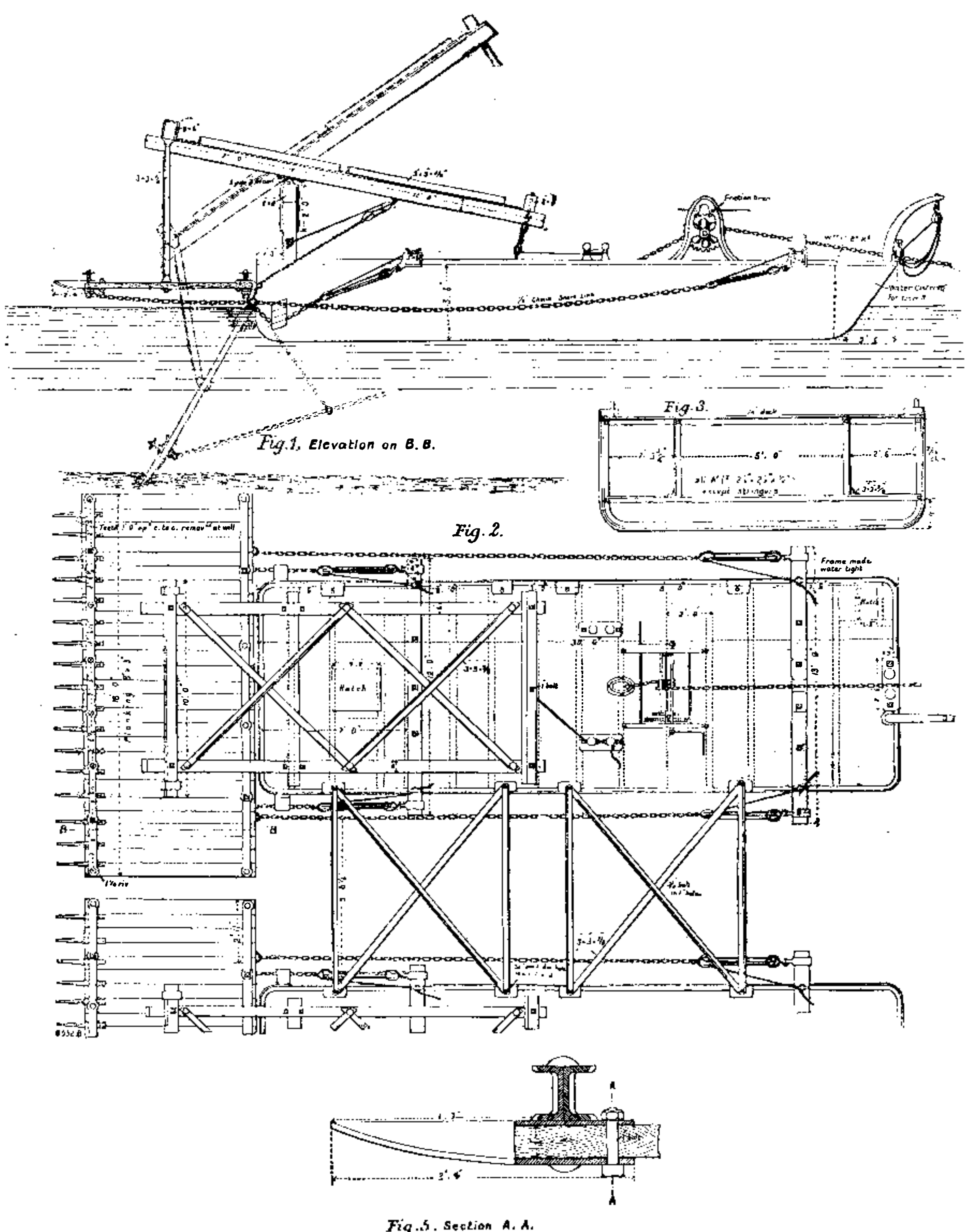
These dams are now in operation on the Orissa coast canals and the Calcutta circular canal. We give illustrations and the following particulars from *Engineering:*

The apparatus consists of an iron boat carrying a dam or shutter (19 feet wide and 8 feet high) over the stern, capable of being raised and lowered by a rocking beam to which it is suspended. When it is desired to scour out the channel, this shutter is let down in the water, until the lower edge is close to the bottom, and it is held there by chains in a position inclined to the current. The boat being secured by warps, the water is let out through the lock valves, and being obstructed by the shutter, it heads up and escapes with increased velocity underneath and on either side of it, and it is practically found that the silt is rapidly cut away and carried into the river. As the bottom is scoured away the warps are slackened out until the whole channel has been swept clean through to the river.

An improved shutter was provided with tines or teeth on its lower edge, which in case of an exceptionally hard bottom are forced into it by letting down the shutter vertically when the lock valves are closed, and the water in the channel is consequently at rest. The water is then turned on and the shutter forces the teeth through the ground, which, being thus plowed up, readily yields to the action of the current.

The Orissa coast canal lock being 20 feet wide, the dams are made 19 feet wide, so as to pass through them; but by diagonal bracing between the boats, two or more can be joined together so as to fit a channel of any width. The perspective illustration (from a photograph) shows a pair of dams working in the channel between the 40 feet wide Chitpore lock and the River Hooghly.

It is found that the dam will, according as the silt is hard or soft, cut away, each time that it is passed through the channel, from 6 inches to 2 feet in depth, and that it is usually passed through a channel 300 feet long in about two hours at low-water time.



IMPROVED FLOATING SCOURING DAM.

Grapes in Chautauqua County, New York.

A writer in the New York *Times* sends the following letter from Jamestown, October 20:

There has sprung into prominence in the past few years an industry which is very sure to give Chautauqua County a more extended reputation than has been earned by the products of her dairies, and that is the raising of grapes and the making of wine. The towns of Hanover, Sheridan, Portland, Westfield, Ripley, and Pomfret for the most part occupy the territory extending back from Lake Erie from one and a half to three miles to the hills, which geologists say are composed of the debris deposited during the glacial period by the incalculable mass of ice which scooped out the Lake Erie basin. For a good while this level strip of land, usually denominated the "Lake Shore," has been noted for the fruits it raised, but not until a very few years has the grape culture overshadowed all others, while the two seasons preceding the present one were the first when the growers organized and made heavy shipments. This year the grape crop will sell for fully $750,000, and the profit is large. The soil does not have as much to do with the quality of the grapes as the fact that Lake Erie on the north and the high hills on the south serve to keep off the frosts until late, allowing the fruit to mature slowly, but very perfectly. Since the craze of planting for grapes began, it has been found that land which for general agricultural purposes was not worth over $10 or $15 per acre is now a good investment at $100 or more, while whole farms are held at three times that price per acre.

A score of years ago, when a man named Harris came from England and founded a "community" at Brocton, in the township of Portland, about midway on the Lake Shore railroad from Buffalo to Erie, he saw the adaptability of the region to the culture of the grape, and began a vineyard, which has since become famous, and the reputation of which would have become still more extended but for the disruption of the settlement. But the start made at that time has given Brocton the lead in grape growing, and it is now the recognized center of the industry, with the only wine cellars and the largest shipping station. In the township of Portland there are now 3,000 acres devoted to grapes, and the yield under careful management is from three to eight tons per acre. The Concord is the standard grape, and probably seven-tenths of all the grapes grown on the lake shore are of this variety, as it is hardy, a large producer, stands transportation well, and can be preserved for months. But the Niagara is a favorite variety, white, not unlike the Malaga grape in appearance, and of very delicate flavor. While all the grapes require much care, especially in the early part of the season, more than the usual time and labor are spent on the Niagaras, some of the growers even going to the extreme of tying paper bags over the bunches when partly grown to prevent bruising and mildew. To a stranger the sight of a 10 acre lot of grapevines bearing brown paper bags is enough to excite the risibilities. In one vineyard this season 20,000 of these bags were thus used.

The harvesting of the grape crop is the period of anxiety for the viniculturist, and, like the hop grower, he brings all the force possible into service—literally "his sisters and his cousins and his aunts." When the harvest is about to begin, the housewife cooks many times the usual quantity of food, and until the vines have been robbed of their bunches of fruit little attention is paid to the creature comforts. From early in the morning until dusk, the vineyards swarm with pickers, and the bunches are carefully clipped from the stalks and packed in baskets or trays, some of them being wrapped in tissue paper to insure their reaching market in the best possible condition. Only the small and imperfect bunches are sent to the wine cellars. The markets for the grapes are principally in the West, Chicago taking the bulk of the product, and car after car at the principal stations is packed full of the delicious fruit, the shipping being done mainly by associations which employ their own shippers and salesmen. The price paid this season on an average has been $45 per ton. The yield this year is the largest in the history of the county.

The wine cellars at Brocton have a storage capacity of about 90,000 gallons, and are not large enough to meet the demands of the trade, as several of the Western railways are using the wines in their buffet cars and station refreshment rooms. Lawrence Oliphant was at one time connected with the Harris community in Portland, and on his visit to this county last spring he pronounced the Brocton wines of the highest quality, and took to his English home a large supply of them, from which excellent reports have been received. The wines sell from one to several dollars per gallon. Some of the grape growers whose temperance proclivities prevent their selling refuse bunches to the cellars scald the juice and preserve it, and the beverage would not offend a connoisseur, while the natives esteem it.

Picking begins about the middle of September and continues through October. Probably between 200 and 300 cars will be filled with grapes from the vineyards of the lake shore towns this season, and the profits are so liberal that every farmer who has a thrifty vineyard will be able to give his daughter a piano or its equivalent next Christmas. For profit, grape growing casts far in the shade everything which Chautauqua County farmers have yet tried to take from Mother Earth.

Cultivation of Annatto.

Annatto thrives in Guadeloupe at an altitude of 500 to 600 meters, but yields less and less as the distance increases above 400 meters. Consul Bartlett says that in cultivating it, it is not necessary to plow the land, but holes are generally dug to plant annatto. These holes have a diameter of fifty or sixty centimeters and thirty or forty centimeters in depth. According to the state of the soil, they are set at a distance of about three meters, and of four meters if the soil is a rich one. The seeds are laid in the ground at once, a few seeds in each hole, and later on, one of the strongest shoots is left to grow, and all the others are pulled up. The young plants require a careful hoeing around them for nearly a year on the whole extent of the plantation. In nurseries the seeds are sown in well-prepared beds, at a distance of about thirty centimeters between each row. These beds are carefully attended to for several months, and when the young plants have attained a height of about forty to sixty centimeters they are placed singly in each hole. The soil around the young seedling is carefully attended to, in order that weeds should not take possession of the holes and destroy the young plants. The plant grows very fast, requiring little care after the plantation has attained a certain size. It blossoms one year after being transplanted, and bears a few pods, but is far from having reached its full size, which may be four to five meters. In a rich soil the trees will meet each other at a distance of four meters, and will shade the whole ground in four or five years. The ground is hoed at least two or three times a year, until the trees have attained their full size. Annatto bears twice a year, the spring blossoms always yielding the largest crop. As soon as the pods in the bunches commence drying and opening, the bunches are cut by means of a pair of shears or a crooked knife. These bunches are packed in baskets and transported to the shed prepared for the purpose. Consul Bartlett says that this is the most tedious part of the cultivation, every pod requiring to be picked with the hands, as much as possible the seeds attached to the white film inside being left untouched. The pods when empty are used as manure. This work of picking, in Guadeloupe, is generally performed by women and children, who are paid at the rate of about five centimes per kilogramme. The crop is gathered from July 15 until the end of August, and it is estimated that one hectare of annatto (the hectare being equivalent to 2.47 acres) should yield on an average 1,500 kilogrammes of green seeds for the two crops, or about seven casks of pulp, weighing from three hundred and fifty to four hundred pounds each.

THE five heaviest hammers in the world were built in the following order: Krupp, at Essen, 1867, 40 tons; Terni works, Italy, 1873, 50 tons; Creusot, France, 1877, 80 tons; Cockerill, Belgium, 1885, 100 tons; and Krupp, Essen, 1886, 150 tons. Thor can take a vacation now.

A Substantial Dam.*

The construction of dams in localities where the stream is small and variable is an important feature. If by a suitable dam all the water which accumulates during the night can be stored for use during the following day, the capacity of the mill is thereby nearly or quite doubled.

Defective and leaky dams are a constant source of annoyance and expense. It is not only the loss of power in dry times by the constant waste of water, but such dams are liable at any time to be carried away by the first freshet that may occur. Thousands of dollars are lost every year in this manner. It is not only the expense of building a new dam with which the mill owner has to contend, but the loss of the earnings of the mill for a month or two while a new dam is being built is also quite an important item in the bill. In nine cases out of every ten, the fault may be traced to a defective foundation.

There are but few localities where a dam cannot be built strong enough to withstand any freshet that may occur. Where the bottom is rock, the mud sills, which form the most important part, should be well secured with bolts driven into it. Where it is earth or sand, it may be necessary to resort to other means in order to secure it. The height and length of the dam, the nature of the bed of the stream, with the probable pressure that may be brought to bear upon it, should all be carefully taken into consideration before the work is commenced.

Suppose a dam fifty feet long and twelve feet high, to be built of timber, is required, and the bed of the stream is rock. The first step should be to calculate the greatest amount of pressure which it may be required to sustain. The pressure upon an inclined surface is equal to the product of one-half the perpendicular height and the length multiplied by 62½. By this means the whole pressure upon the dam in pounds may be obtained when it is just full. But in times of high water the depth of the sheet which may be liable to flow over it must be taken into consideration, for the pressure will be increased as the depth, and in this case two feet at least should be allowed. Now, one-half of twelve feet is six, and two feet allowed for high water is eight, then $50 \times 8 = 400 \times 62\frac{1}{2} = 25{,}000$ pounds.

Excavations should be made in the banks on each side of the stream, to admit of suitable abutments being built, which should be of stone laid up with water lime, and carried far enough above the proposed height of the dam to prevent the water at any time flowing over them. The bed of the stream, where the foundation will rest, should be leveled off as nearly as possible, so as to give a good bearing for the mud sills. These, to resist the action of the elements and withstand the pressure of a dam of this height, should be of oak twelve inches square, if that kind of timber can be conveniently obtained, and laid the whole length across the stream, from one abutment to the other, and secured to the rock by rock bolts 1⅛ inches in diameter and about thirty inches long, and not over six feet apart.

A rock bolt is a piece of round iron, with a head upset upon one end and the other split about two inches or more from the end. Into this split the end of a thin, tapered iron wedge is inserted just far enough to hold it while it is being put down into the rock through the timber. The hole which is drilled to receive it should be just deep enough to correspond with the length of the bolt, and allow the end of the wedge to rest upon the bottom of the hole before it is driven. With the end of the wedge resting upon the rock at the bottom of the hole, if the bolt is driven down with a sledge, the wedge is forced into the end of the bolt, where it is split, and spreads it apart so as to force it against the sides of the hole.

Bolts well fitted and driven down in this manner will never give way, no matter what the strain may be upon them.

Mortises should then be made in the sill between each bolt, and uprights of the same size framed into it of a length corresponding with the height of the dam, allowing, of course, for the thickness of the stringer, which should also be framed upon the top of them and run the whole length of the dam, and should be the same size as the sills. This completes the first part of the structure.

Another mud sill corresponding in size with the first should now be put down twelve feet above it, and fastened to the rock in the same manner. Timbers or joists, 3×8 or 4×12 inches square, should now be laid about two feet apart, one end resting upon the upper mud sill, while the other rests upon the top of the former part of the structure, thus making an angle of forty-five degrees with the bed of the stream. Each end of the joist should be secured to its respective timbers by bolts, when the whole surface may be covered with planks well spiked to the joists. This completes the structure as far as the millwright is concerned.

The arrangement for the head gates and flume to be attached to it will vary according to circumstances, and their location, etc., and will readily suggest itself to the practical millwright.

To avoid small leaks, and to secure the planking from injury, it is well to cover them to a considerable depth, especially toward the bottom, with earth or gravel.

When the bed of the stream is hard earth or clay, posts should take the place of the rock bolts, and be sunk at least six feet below the bed of it, and the mud sills bolted to them, otherwise the structure may be the same. The bottom below the dam, however, for a considerable distance, should be either covered with planks or filled in with stones, to prevent the overflow washing out the earth which sustains the posts.

Where quicksand forms the bed of the stream, which fortunately is not often the case, it is almost impossible to build a permanent and reliable structure of this kind without first driving piling and then planking it over for the foundation. In such cases two rows of piles should be driven across the stream, twelve feet apart, for a dam twelve feet high, to secure the upper and lower mud sills, and as close together as may be convenient, but not in any case more than three or four feet apart. The mud sills should be securely bolted to each pile, and the whole space between them should be either well grouted with stone and water lime or covered with planks, which should extend at least ten feet below the overflow.

The grouting, if put in to a proper thickness, is no doubt the best, but as it is quite expensive, planks, if well put down, will answer the purpose.

When the structure is completed, to secure the upper side and prevent the water working under the mud sill located there, the bottom for some distance above it should be puddled with clay before the earth and gravel filling is put on.

If sufficient care is manifested in all these details, there is no locality where a good and permanent dam cannot be erected. But it is frequently neglect in some of the small details which leads to disaster.

It is well for the practical millwright to remind those who are about to put up structures of this kind that it is better for them to spend a few extra dollars in making everything perfectly secure than to be obliged in a short time to spend several hundred for a new dam, which is liable to be carried away by the first freshet which may occur.

*C. R. Tompkins, in the *American Miller*.

Hints for Builders.

The *Builder and Woodworker* gives the following advice to builders and to those who have not had much experience in working up old materials. The suggestions will be found valuable:

Never compete with a "botch," if you know he is favored by the person about to build. He will undercut and beat you every time.

In tearing down old work be as careful as in putting up new.

It costs about 15 per cent extra to work up old material, and this fact should be borne in mind, as I have known several contractors who paid dearly for their "whistle" in estimating on working up second-hand material.

These remarks apply to woodwork only. In using old bricks, stone, slate, and other miscellaneous materials, it is as well to add double price for working up.

Workmen do not care to handle old material, and justly so. It is ruinous to tools, painful to handle, and very destructive to clothing.

In my experience I always found it pay to advance the wages of workmen—skilled mechanics—while working up old material. This encouraged the men and spurred them to better efforts.

Sash frames, with sash weights, locks, and trim complete, may be taken out of old buildings that are being taken down and preserved just as good as new by screwing slats and braces on them, which not only keeps the frame square, but prevents the glass from being broken. Doors, frames, and trims may also be kept in good order until used by taking the same precautions as in window frames.

Old scantlings and joists should have all nails drawn or hammered in before piling away.

Counters, shelving, drawers, and other store fittings should be kindly dealt with. They will be wanted sooner or later.

Take care of the locks, hinges, bolts, keys, and other hardware. Each individual piece represents money in a greater or lesser sum.

Sinks, wash basins, bath tubs, traps, heating appliances, grates, mantels, and hearth stones should be moved with care. They are always worth money, and may be used in many places as substitutes for more inferior fixings.

Marble mantels require the most careful handling.

Rails, balusters, and newels may be utilized much readier than stairs, as the rail may be lengthened or shortened to suit variable conditions.

Gas fixtures should be cared for and stowed away in some dry place. They can often be made available, and are not easily renovated if soiled or tarnished.

It is not wise to employ men who have nothing but their strength to recommend them. As a rule they are like bears—have more strength than knowledge; and lack of the latter is often an expensive desideratum. Employ for taking down the work good, careful mechanics, and do not have the work "rushed through." Rushers of this sort are expensive.

Have some mercy for the workman's tools. If it can be avoided, do not work up old stuff into fine work. If not avoidable, pay the workman something extra because of injury to tools.

Don't grumble if you don't get as good results from the use of old material as from new. The workman has much to contend with while working up old nail-speckled, sand-covered material.

Clarifying.

Clarification is a process by which any solid particles suspended in a liquid are either caused to coalesce together or to adhere to the medium used for clarifying, that they may be removed by filtration (which would previously have been impossible), so as to render the liquid clear.

One of the best agents for this purpose is albumen. When clarifying vegetable extracts, the albumen which is naturally present in most plants accomplishes the purpose easily, provided the vegetable matter is extracted in the cold, so as to get as much albumen as possible in solution.

Egg albumen may also be used. The effect of albumen may be increased by the addition of cellulose, in form of a fine magma of filtering paper. This has the further advantage that the subsequent filtration is much facilitated.

Suspended particles of gum or pectin may be removed by cautious precipitation with tannin, of which only an exceedingly small amount is usually necessary. It combines with the gelatinous substances better with the aid of heat than in the cold. There must be no excess of tannin used.

Another method of clarifying liquids, turbid from particles of gum, albumen, pectin, etc., is to add to them a definite quantity of alcohol. This causes the former substances to separate in more or less large flakes. The quantity of alcohol required varies greatly, according to the nature of the liquid. It should be determined in each case by an experiment on a small scale.

Resinous or waxy substances, such as are occasionally met with in honey, etc., may be removed by the addition of bole, pulped filtering paper, and heating to boiling.

In each case, the clarifying process may be hastened by making the separating particles specifically heavier, that is, by incorporating some heavier substance, such as talcum, etc., which may cause the flocculi to sink more rapidly, and to form a compact sediment.

CLARIFYING POWDER FOR ALCOHOLIC LIQUIDS.

Egg albumen, dry	40 parts.
Sugar of milk	40 "
Starch	20 "

Reduce them to a very fine powder, and mix thoroughly.

For clarifying liquors, wines, essences, etc., take for every quart of liquid seventy-five grains of the above mixture, shake repeatedly in the course of a few days, the mixture being kept in a warm room. Then filter.

Powdered talcum renders the same service, and has the additional advantage of being entirely insoluble. However, the above mixture acts more energetically.—*Eugene Dieterich, in Neues Pharm. Manuale (Ed. II.); Amer. Druggist.*

The Compressibility of Gases.

M. Amagat has communicated to the *Comptes Rendus* some observations upon the compression of gases—comprising oxygen, hydrogen, nitrogen, and air—to pressures reaching 3,000 atmospheres. The author remarks that his results differ considerably from those published by Natterer, since, for the same reduction of volume of the gases observed, he has generally found the pressures to be very much greater than those given upon Natterer's authority—a result which he ascribes to the probable and even inevitable errors of the processes adopted by that experimenter. M. Amagat finds that at a pressure of 3,000 atmospheres, and at a constant temperature of 15° C., a volume of the following gases which is equal to unity at the ordinary temperature occupies the following spaces: Air, 0·001401; nitrogen, 0·001446; oxygen, 0·001235; hydrogen, 0·000964. Under extreme pressures, oxygen, nitrogen, and air have nearly the same compressibility, which is according to the room occupied by the liquids. At 3,000 atmospheres it is about equal to that of alcohol under the normal pressure. The compressibility of hydrogen is much greater—nearly double, in fact. At 3,000 atmospheres it is nearly equal to that of ether at about the normal pressure. The densities of these gases when compressed to 3,000 atmospheres are given as follows by M. Amagat, water being taken as unity: Oxygen, 1·1054; air, 0·8817; nitrogen, 0·8293; hydrogen, 0·0887. These values have been determined by assuming the number generally admitted for the compressibility of the glass envelopes of the liquids.