

now exists where formerly all was suspicion and hatred. The changed relations of employer and employed have been recognized; they have met at the same table as equals; and out of this has grown a condition of affairs that will make it impossible for the old conditions to return. Mr. A. J. Mundella, M.P., who has been so largely instrumental in the initiation of this wise institution in England, gives many striking instances of the successful operation of permanent arbitration boards in that country. He says: "If the workman of any branch conceive that they have grievances to complain of, in addition to the ordinary representatives of that branch a delegate may attend and lay the case before it. The first business at our meetings is to receive delegations. They retire after having made their statements, and the board proceeds to deliberate. We have never met without settling at least half a dozen questions, some important and some trivial, which, if allowed to remain open, would produce irritation. * * * A large part of the credit of the success of this board, and this change in the relations of classes, is due to the provision for regular meetings of the board. The great curse of industry, and the fruitful cause of difficulty, is a foolish obstinacy and a false pride. This arises in many cases from a want of knowledge and a lack of common courtesy in matters concerning both capital and labor, and in which both have an equal interest. This quarterly coming face to face, this meeting as equals,—and in all questions that come before this board they are equals, and it is foolish to ignore this fact,—and this discussing of subjects of common interest as sensible men seeking for the facts and inclined to moderation and concession if need be, have had a marvellous effect in removing this pride and obstinacy, and bringing about that respect and courtesy that must be the basis of all friendly negotiations between capital and labor." In France there is the "Conseils des Prud'hommes," probably the oldest system of arbitration in existence, and which provides a simple and effective method of adjudicating all labor troubles and disputes. They are composed of an equal number of masters and workmen, each trade electing its own representatives, with a president and vice president named by the government. Arbitration is compulsory upon the application of either, and the decisions of the court can be enforced the same as any other court of law. Fully 95 per cent. of the cases brought before these boards have been amicably settled. In the States of Massachusetts and New York, and elsewhere in the United States, arbitration has speedily and unostentatiously decided many cases, which, if allowed to proceed, would have developed into serious strikes and lock-outs. Trade disputes, such as those at Springhill and at Wellington, are, happily, of rare occurrence; but as our country develops, and our mineral and other important industries expand, the possibilities of more frequent friction are apparent. So im-

pressed was the Royal Commission appointed by our own Government to enquire into the relation of capital and labor, that in their Report, published last year, the necessity of a permanent, as well as local boards in industrial centres, was strongly emphasized. During the last session of the Legislature of Nova Scotia provision was also made, under the Mining Act, whereby labor disputes should be submitted to a board to consist of two arbitrators appointed by the workmen, two representing the company, the four thus chosen to select a fifth, or umpire. This was an excellent and wise provision. But at Springhill it appears that the company refused to submit to arbitration, apparently determined to starve the men into their unreasonable demands. The result has been eight weeks of a most distressful strike, which has not only crippled the operations of the company and been keenly felt by the men, but has also seriously affected trade, both in the vicinity of the mines and in the upper provinces. Strikes are neither rational nor civilized, and, as in these cases, invariably involve loss and hardship. The vital interests of master and miner must necessarily depend on unity, and only by the harmonious action of both can great material progress be attained. Let both meet each other fairly in a spirit of full acknowledgment of each other's rights and duties; when differences occur let them be submitted to a competent board of arbitrators; and when one or other fail to agree on this course, as at Springhill, and at Wellington, let the government step in and make immediate arbitration compulsory.

Suicidal Strikes.

Mr. Powderly, the prominent leader in the labor disputes across the border, is reported to have said, at a Pennsylvania meeting on the 14th June last, "But we are not in favor of strikes. We think they are suicidal. I will say that I have never known of a strike which has been won by the men where the evil consequences have not overbalanced the benefits." The miners at Springhill and at Wellington will bear witness to the truth of his statement.

Cement in Ontario.

The value of the export of cement from Britain to the United States and Canada, for the first half-years of 1888, '89 and '90, stands as follows:—

	1888.	1889.	1890.
To United States...	\$1,094,126	\$941,075	\$1,190,375
To Canada.....	64,000	78,107	108,538

Our neighbors claim they are making cement equal to the English article, but their importations show no decline. The maximum duty is 40 cents, which should not be prohibitory of the Canadian article if we had a first-class one to offer. And why not? We should be well able to make first-class hydraulic cement in Ontario.

Steam Pumps.

Hints on their Selection and Practical Management.

(From the Safety Valve.)

In the first place, regarding the selection of a steam pump, with so many excellent pumping machines in the market, this is a difficult subject to discuss and one that we cannot go into without doing somebody an injustice. It must therefore suffice if we direct attention to a few cardinal points that every steam pump to be entitled to choice should possess. Simplicity of construction is materially an advantage, but like everything else, it may be overdone. In itself it can hardly be regarded as forming a reliable basis for selection, although the simplest pump that conforms to all other requirements, such as efficiency, durability, reliability, &c., is undoubtedly the best. At the same time, the very nature of the work a steam pump is ordinarily called upon to perform, demands that its parts shall be readily accessible for inspection, and neither so costly nor so intricate as to be difficult of replacement in case of wear or breakage. A pump that is made on the interchangeable plan as to its parts, has many advantages in this respect. This applies particularly to the water valves, which are liable to become obstructed by foreign bodies in the water or where the pump is employed for moving thick or gritty fluids.

Select a pump if possible in which the valve motion is reliable at any speed—in other words, a steam pump that can be run at the extreme limit of slowness or at its highest capacity without fear of the steam valves failing or becoming deranged. Pumps have been placed on the market that are liable to slacken off and stop if run "dead-slow," or to run away if left to operate at high speed, and such unreliability, especially where boiler feeding or circulating service is demanded, is likely to prove dangerous. A pump that has "dead centers," is for like reasons undesirable and it is moreover a frequent source of trouble where it is necessary to "start up" in a hurry. A reliable steam pump, such as the best makers supply, will run steadily and constantly at a speed proportionate to the steam supplied and will start promptly from any part of the stroke as nearly as possible at full pressure. The pump valves should have an area of about one-fourth the area of the pump.

Never buy or install a pump that you suspect to be too small for its duty; one or two sizes too large will do no harm, but half a size too small will make an immense amount of trouble. It is easy to determine the capacity of a pump by multiplying the area of the piston in inches by its stroke in inches which will furnish its full capacity per stroke in cubic inches, and divided by 231, in gallons. An allowance of at least twenty per cent., and in some instances more, must be made in these calculations for the leakage caused during the rise and fall of valves, inaccuracies in fitting, &c., as well as the "clearance" between the valves and the piston or plunger. If it is a question of forcing water to a certain height, multiply the amount of water in gallons to be raised per minute, by the weight of one gallon (835 pounds) and the product by the height in feet of the discharge from the point of suction. The result, divided by 33,000, will give the theoretical horse power required to accomplish the work, but a liberal allowance, never less than ten per cent. and in some cases as high as thirty per cent., must be made for friction in pipes and bends, for leakage in pipes, leakage and friction in pump, &c. The speed at which a pump should be run must also be taken into consideration—a boiler feed pump, for instance, should not be run at a higher speed than about forty double strokes per minute. Where water has to be pumped through a long and particularly a vertical line of pipe, a slow movement is more economical and will furnish the best results. A small pump, working rapidly, is subject to greatly increased wear and tear under such conditions, especially where no check valve is provided to relieve the pressure on its valves. The velocity of water in pump passages should not exceed 500 feet per minute.

For condensing engines, the feed pump should have a pump plunger equal in diameter to one-eleventh the diameter of the steam cylinder when the pump stroke is one-half the engine stroke and one-eighth the diameter of the steam cylinder when the pump stroke is one-quarter the stroke of the engine. The capacity of a pump for boiler feeding should never be less than one cubic foot of water per hour to each horse power. It must be considered also that water expands when heated, and where hot water is used in feeding, the capacity of the pump should be increased so that it equals the equivalent in cold water.

In setting up a steam pump run all lines of pipes as direct as possible, every bend increases the friction to be overcome. Short bends and short angles should be avoided wherever possible; they retard the flow of water and increase the work of the pump. Where turns or bends must be made, have them as easy as possible. Pipes should be as large as the pump connections at least, and where very long or very crooked, larger sizes must be used. The discharge pipe should never be re-