Lubricating and Cylinder Oils.

An interesting and instructive address on lubricating and cylinder oils was recently delivered by Scott A. Smith before the Rhode Island Engineers' Association, Providence.

He made comparison of different oils, regarding the impurities they contained, and explained the methods employed in refining. He said that for purposes of lubrication, where metal is working upon metal, sperm oil is the best, lard oil second, neat's foot third, and tallow oil fourth. The best grade of animal oil is that which contains the least stearine and no free acid.

Regarding the friction of oils upon their own particles, lard oil is two and one-third times as long in running out of this tube at 70° as sperm; then we must consider that we have the weight of one ounce of oil compared with another ounce moving upon itself. The result, so far considered, is vastly in favor of sperm as a light running oil; but in actual use, where bearings have a stress of 300 pounds and upward to the square inch, then this great difference tends rapidly to disappear.

If you work bearings with 1 pound pressure to the square inch, use sperm; if at 500 to 600, or as a locomotive practice up to 1,200 and more, then you may find lard the best, particularly at about half the price per gallon of sperm. Petroleum, consisting of hydrogen and carbon, is eminently fitted for lubrication, as it contains none of the destroying element—oxygen.

The average quality of petroleum oils has been much improved within a few years, partly for the reason that consumers have exacted a better article, and partly because of the competition of dealers, who have marketed their oils on their merits. It is, I think, not too much to hope for that, within the next ten years, or less, the qualities of pure petroleum oils may be so improved that, with improvements in the shaft bearings of machinery, and some provisions against accidental overheating, all lubrication may be possible with petroleum alone. Use as little animal oil as possible, on account of high cost, waste by careless handling, its active acid qualities, and its tendency to gum.

The gumming of animal oils exists independently of the active acid principle, and is the result of oxidizing. Petroleum oils have no active principle to neutralize the acid of animal oils.

Petroleum cylinder oils, so made that they will do the best work in any and all engines, are the result of much scientific and practical study, and the processes of their manufacture are very complicated. They contain no acid, and cannot develop any by heat and work. Their flashing point is not less than 400°; gravity, 25° to 28° at 100° Fah.

In conclusion, petroleum cylinder oils have peculiar and distinctive qualities to recommend them for this special use—great heat-resisting power, freedom from all acid qualities, freedom from all tendency to gum, and their remarkable property of spreading on heated surfaces.

The speaker suggested that the Engineers' Association might gather in the experience of its individual members in past years with various kinds of oils under the conditions of actual use. I make bold to formulate this plan:

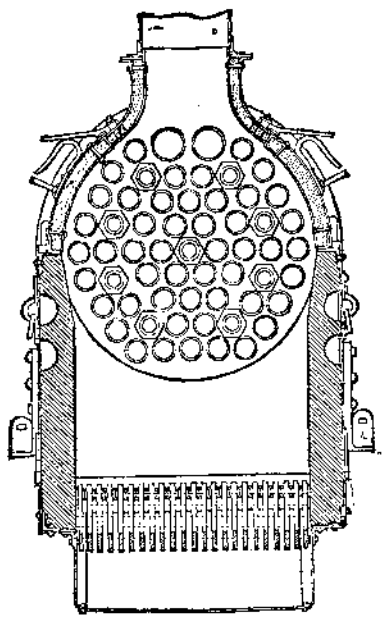
Prepare and have printed suitable directions, with questions to be answered; also, a request for a full account of their experience with oils; with, however, this requirement, that no one shall give the maker's name, or any reference thereto, but simply describe the oil to the best of his ability.

Means can be furnished members by which they can get the cold test, gravity, and flash of the oil now in use.

The reasons why I would exclude the maker's name are these: The prime object should be to get information about oils, and not to advertise them.—*Providence Journal.*

A COMPACT BOAT BOILER.

Our illustrations represent a boat boiler designed by M. V. Cadiat, a French marine engineer. In this boiler the heating surface is derived principally from a group of brass tubes inclined at an angle of 45 deg., and



CADIAT'S IMPROVED STEAM BOILER.

through which the water circulates. These tubes stand immediately in front of the grate and are fixed in two tube plates. A certain number of the tubes are made to act as stays by being fitted with double nuts at the ends. Each of the tube plates has a thickened margin; the upper one is bolted to a spherical steam chamber, and the lower to a smaller chamber or dish, provided with mud hole doors. Two of the tubes which are at the side of the group further from the fire are of a large diameter, in order to provide for the downward current of water. A baffle plate in the dome, at about the water level, aids the circulation by deflecting the stream toward the larger tubes.

The spherical dome carries the safety valve, water gauge, and the like. With the exception of the water gauge all the fittings are grouped upon a special pipe connected to a steam separator inside the dome. This consists of a helical tube of three turns, upon the outer side of which there are a number of small holes, provided with inclined plates. As the steam and water rush through this pipe the particles of water are, by the centrifugal force, thrown through these holes into the casing, from whence they return to the boiler, while the steam is emitted dry at the bottom of the helix. The boiler is lagged with an envelope which surrounds the upper part of the group of tubes, and is fixed to the inner sides of the tube plates. The furnace is lined with firebrick. Neither the walls of the firebox nor the casing around the tubes adds to the heating surface of the boiler. The dome is covered with felt, and covered with polished brass. The arrangement of the doors for gaining access to the tubes, and the manner of carrying the chimney, are clearly shown in the engravings.

Engineering says: We are informed by the makers, MM. Edouard Mourraille & Co., Toulon, France, that a trial of one of these boilers has given the following results: The boiler in question had a heating surface of 63 square feet and a gratesurface of 2·15 square feet. The pressure was 100 pounds per square inch, and the weight of the boiler and water one ton. It was fitted in a small boat having a single cylinder noncondensing engine, with the exhaust in the chimney. The coal burnt per hour, with easy firing, was 154 pounds, or 71 pounds per square foot of grate surface. This evaporated 921 pounds of water, or 6 pounds per pound of coal. The indicated horse power was 20.

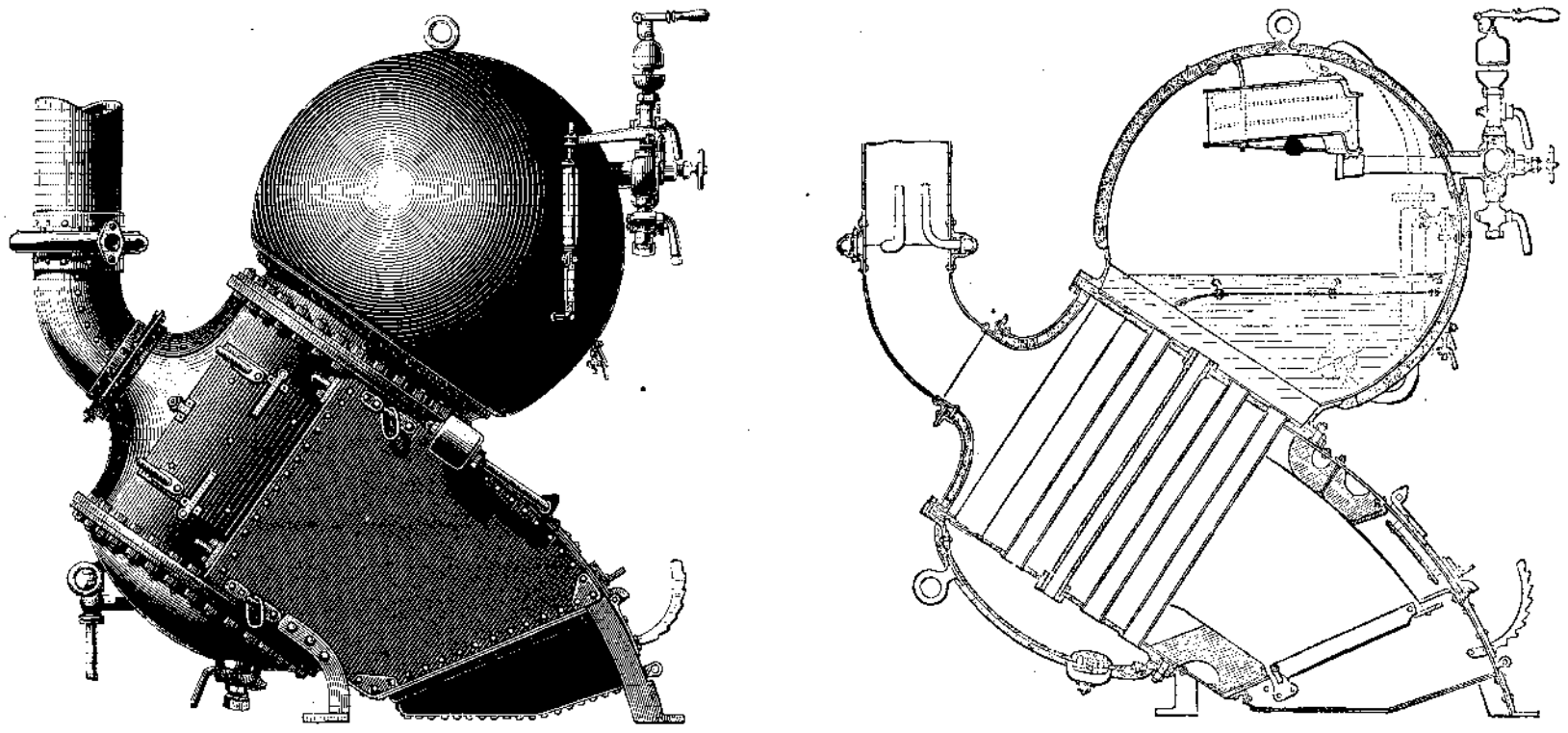
The merit of the boiler lies in its compactness and the ease with which the internal parts can be reached. The entire wear is thrown upon the tubes, which can be easily renewed.

The Utilization of Bagasse.

The utilization in sugar making countries of the residual canes—bagasse—for fuel and gas making is an important practical problem which has yet been only partially solved. The great drawback to the profitable combustion or carbonization of this highly carbonaceous material has been the large proportion of water which it contains, as ordinarily treated by mills, presses, etc. It is stated, however, in the *Revue Industrielle*, that M. Pellet has succeeded in devising, to the order of the Fives-Lille Company, a system of dealing with the material which produces, by direct compression, a combustible containing not more than 40 to 50 per cent of water. In this state the waste can be burnt directly in boiler furnaces or carbonized without previous drying. This result is obtained by a preliminary division of the pieces of cane in a special apparatus, whereby the after-compression of the material by presses of any convenient kind may be usefully secured. The compressed material is formed into bricks by the addition of powdered fuel, ashes, or lime. It is cited as a remarkable instance of the utilization of a waste product reacting upon the original value of the material, that this conversion of waste sugar-cane into a useful fuel will render possible a special treatment of the cane, which will result in simplifying processes, saving labor, and increasing the yield of the raw article.

Accidents from Machinery.

It has been settled by a decision of the Supreme Court of Pennsylvania that machinery, once adjusted to its place in a factory, is presumably properly constructed, and may be operated without danger to the operative charged with its care. In case of an action for damages from injuries, there must be direct and conclusive evidence to overcome this presumption. The meaning of this decision to employes in this State is that any personal injuries they may sustain from exposed machinery will be at their own risk, so far as legal remedies are concerned. At first sight this may seem a hard thing, but reflection will lead inevitably to the conclusion that no other basis of equity could be found by the court. To make the owner of machinery liable for individual carelessness is to put a premium upon stupidity. The remedies for gross neglect of precautions to secure ordinary safety will never be denied, but the reckless trifler with whirling wheels must run his own risks.—*Phil. Record.*



CADIAT'S IMPROVED STEAM BOILER.

James Watt Anniversary.

The anniversary dinner of the foremen engineers of the Clyde, in honor of the third jubilee or 150th anniversary of the birth of James Watt, was held on Saturday evening, the 23d of January, in the Grand Hotel, Charing Cross, Glasgow, under the genial presidency of Mr. John Ward, of the Leven Shipyard, Dumbarton. The occasion was marked with all that enthusiasm and *esprit de corps* for which these annual dinners are famous. The chairman was supported by Mr. F. H. Underwood, Consul for the United States. The croupier's chair was filled by Mr. G. Russell Motherwell, who is president-elect for next anniversary. The gathering, which numbered about one hundred and fifty, also included many of the leading members of the trades interested on the Clyde.

The chairman, in submitting the toast of the evening, "The Memory of James Watt," gave a succinct and choicely worded *resume* of the life and work of this illustrious engineer. In introducing his subject, he said: "Just as we love to remember in our family life, and our national life, the birth anniversaries of those near and dear to us, or who have done well for their country, and deserve well at our hands, so do we, or we ought, as lineal descendants of our patron saint, take pleasure in meeting together to celebrate this, the third jubilee anniversary of his birth, and hear once again of the intellectual battles he fought, of the victories he gained, and of the honors he won—battles none the less real because they were bloodless; victories none the less enduring and of lasting benefit to his country and to mankind in general because they were peaceful; and honors which deservedly crowned him with wealth and fame, but which fell far short of what would doubtless have been his had his battles been of a military character, and his victories gained at the loss of precious lives and the desolation of many hearths and homes."

Having traced in a highly interesting way the early efforts and later successes of Watt, the speaker said that it was a duty lying on "any one proposing this toast to bring to remembrance the great help Watt had received from that great and inventive genius who was so closely associated with him in his later improvements on the steam engine. I refer to our countryman, William Murdoch. This great and original genius was engaged by Boulton and Watt in 1777 (three years after their commencement in business), first as a mechanic at 15s. a week, and latterly in directing the erection and working of the mine engines set up by the firm in Cornwall, the salary given him by them for this work being £1 per week. At the age of 44 he asked for an increase, and not receiving a prompt reply, he resigned his position.

"As a result of this the firm showed the appreciation in which they held him by offering him the general managership of their works, at a salary of £1,000 a year, which he accepted. But that his resignation had taken place before any tangible appreciation of his worth was given by the firm, even when holding a position of trust, leaves an unpleasant feeling in the minds of impartial thinkers. As the inventor of the first locomotive engine, of the first oscillating and the first slide valve engines, Murdoch showed his wonderful ability and genius; but especially as the founder and inventor of gas lighting will his name ever be best known to mankind. If, however, Boulton and Watt made scant recognition of his worth until compelled by his leaving them to do so, what shall we say of those who have for many years taken the free gift which he gave to the world, and especially those who have and are making large fortunes thereby, without any recognition whatever? Right glad am I to know, gentlemen, that there some members of his profession with us this evening who are at this moment striving to atone for past neglect, and in the success with which their efforts for a national memorial to him are being crowned, are doing honor to his memory as well as to the profession which they themselves adorn."

Speaking of later times, the speaker concluded: "While great improvements have since been made upon the steam engine, yet in essential points it still remains as Watt left it, his successors in the profession being content if they could simply add their stone to the structure whose foundations have been so firmly laid. The men of the Clyde, and particularly members of this association, have pride in knowing that the greatest improvements on the steam engine since the days of Watt have emanated from brains trained, as his was, on the banks of the Clyde—notably surface condensation and the compound marine engine; while more recently engines with great pressures, and triple and quadruple expansions, are the latest laurels of the profession. And so the steam engine goes steadily forward on the march of progression, until now we see it the great lever which has influenced society, and brought about more changes upon the face of the world than any other power. Steam navigation has also made great progress within the last 25 years. True we have the Great Eastern, which must ever remain a tribute to Brunel & Scott Russell's genius, but as a profitable and speedy steamer she was never successful. Dr. Lardner, in 1835, addressing a Liverpool audience, said: 'As to the project which was announced in the newspapers of making the voyage directly from New York to Liverpool, it was, he had no hesitation in saying, perfectly chimerical, and they might as well talk of making a voyage from New York or Liverpool to the moon.' That declaration can never be more fitly recalled than at a time like this, when marine engines admit of vast power being packed in little space—when we have steam at sea as on shore, cheaper than the unbought wind, and when enormous floating palaces are constantly making the passage in a little over six days. What further advance remains to steam navigation it would be unwise to conjecture, but we know that at the present moment we are building on the Clyde vessels to beat the highest speeds we have yet reached, and even then the limits of steamship achievements will not be defined."

Succeeding toasts were: "The Trade and Commerce of Glasgow," submitted by Mr. J. M. Cherrie, of Parkhead Forge, and responded to by Mr. Underwood, U. S. Consul; "The Association of Foremen Engineers," proposed by Mr. P. Denny, Jr., and replied to by the Croupier; "Shipbuilding and Marine Engineering on the Clyde," proposed by Mr. J. W. Millar, replied to by Mr. J. P. Wilson; "The Iron and Steel Trades," proposed by Mr. J. Turnbull, Jr., acknowledged by Mr. McLelland, of the Steel Company of Scotland. Other toasts were: "The Railway Interests," "The Visitors," "The Chairman," and "The Croupier." In the course of the evening, which was much enjoyed throughout, several of the company entertained the gathering with songs.

The Eight Hour Movement.

Congress long since enacted that eight hours should constitute a day's work for those engaged in the employ of the United States. The enactment has not been adhered to, and a measure is now before Congress to reimburse those who have worked more than eight hours, for overtime. Should the measure pass, it is estimated that it will take about three millions of dollars to pay the bills. City governments are susceptible to several influences which would favor the success of a movement of this character. The favor of the working classes, the ability to increase the number of employes and thus incidentally reduce the number of needy persons, are some of the considerations which make city governments regard the movement favorably. In a few instances the eight hour system has been adopted by cities, while in others the question is now being agitated.

The arguments used in favor of eight hours constituting a day's work are primarily that it would give employment to many more persons and relieve the glut of the labor market; that it would give more time for recreation, mental and social improvement, and thus, by bettering the condition of the wage-earning class, elevate society as a whole. Although, as has already been noted, those who demand a reduction in the hours of labor express a willingness to accept a corresponding reduction in wages, it is evident that this is merely a temporary expedient to let employers down easy. The advocates of the eight hour movement expect that after the system has been inaugurated they will then be able to secure an advance of wages to old ten-hour rates. Indeed, as much was acknowledged publicly by the principal speaker at a monster eight hour meeting in Chicago held recently. His words were that "if the eight hour movement is pushed to a successful issue, twenty per cent more labor would be needed, and that as the demand for labor increased, wages would become better and better." This we believe to be the "milk in the cocoanut." The advocates of the eight hour movement expect, in reality, to cut down the working day two hours, and receive the same pay, after a little, as at present.

So important a matter as the dropping off of one-fifth of the hours heretofore constituting a day's work cannot fail to be of great importance to employers, and they are, as a matter of course, considering the subject in its various bearings upon their interests. In a few lines of manufactures, in which most of the labor is done on the piecework system, the adoption of the eight hour system would make no great difference. This would not be the case, however, in many, if not in the majority of cases, where the work is largely done by the piece. An increase in the number of persons employed would require more space, more tools, more machinery or apparatus, and would in some instances call for the employment of additional help which does not work by the piece. This would be particularly true in large cities, and will be apparent to intelligent readers without going into a detailed explanation. In lines in which costly machinery is employed, it is often necessary to keep the machinery running long hours in order to obtain a just return for the investment. On the whole, the conclusion is inevitable that a reduction of the hours of labor is equivalent to an increase in running expenses. This increase may not be quite in the exact proportion of the reduction in the hours of labor, where the piecework plan is in operation, but it will approximate to it in many cases.

In enterprises where labor is paid for by the week or month, the increase in the cost of production by a reduction of the hours of labor is entirely obvious. A concern employing one hundred men ten hours would lose twenty days' work every day by the adoption of the eight hour system; an establishment employing five hundred men would lose one hundred days' work every day. This will give an idea of the amount of reduction in production which would arise from the adoption of the eight hour system, with present working forces. A corresponding reduction of wages, if adhered to, would, of course, relieve employing producers in a measure, but could not altogether compensate for the reduction in labor. But, as we have already noted, it is not expected that wages would remain permanently reduced. It is hard enough now for thousands to live, both day and piece hands, and they would not consent to a reduction in the hours of labor if they expected a corresponding permanent reduction in wages. Such a reduction would only bring increased privation in families whose lot is already hard enough.

The conclusion is inevitable that a general adoption of the eight hour system would increase the cost of production and enhance the price of goods to consumers, including, of course, wage-workers themselves, and would have a tendency to stimulate immigration. How far a restriction of production and enhancement of the selling price of goods would reimburse manufacturers for the disadvantages which we have shown would accompany the proposed reduction in the hours of labor, is a matter which experience only can demonstrate. Capital will not seek investment except where a profitable return seems clear to the investor. How far the adoption of the proposed measure would influence capital unfavorably, it is difficult to say. One thing is already a fact in Chicago, and that is that bids and estimates for public and private buildings, now offered, contain a margin of some thousands of dollars for possible labor difficulties, and this will have the effect, in some instances, at least, of influencing some parties to defer building who would otherwise do so.—*American Artisan.*

PHOTOGRAPHIC NOTES.

Method of Producing Uniform Enlargements.—We recently had occasion to enlarge a small negative of a child clothed in a fine white lace dress, upon gelatine bromide paper, and experienced some difficulty in obtaining sufficient detail in the dress without sacrificing the high lights in the face. An exposure for the face was too short for the dress, inasmuch as the density of the negative in the face was out of proportion to that in the dress.

Having already spoiled one enlargement by over-exposure, we took a pair of scissors and cut out of it the face and other portions of the picture which we wished to have protected, and proceeded as follows: First the image was focused on the enlarging screen, the size of the face being exactly the same as that which had previously been cut out. Then an exposure was made for fifteen seconds on the sensitive sheet, the cap of red glass was next put over the lens, and the cut-out sheet of paper representing the face was slightly dampened and placed in position over the image, on the screen, so that it matched the image exactly. The moisture in the paper was sufficient to cause it easily to adhere to the sensitive sheet. After this a second exposure for fifteen seconds more was made, then the cut-out sheet was removed and the sensitive sheet developed in the usual manner. One portion of the picture had twice as much exposure as that which was masked. As a result, the fine delicate tracery in the white dress was fully brought out, while the high lights of the face and other masked portions were well preserved and of agreeable quality. The dampening of the film of the sensitive sheet while on the screen did not injure in the least the resulting picture.

Improved Screen for Lantern Pictures.—In a lecture recently given before the Society of Amateur Photographers of this city, by Mr. Geo. M. Hopkins, on "Polarized Light," a simple, but effective, screen was employed. It consists of heavy bluish white tracing paper, secured by mucilage or flour paste to a common wood hoop, four feet in diameter.

The audience viewed the pictures from the side of the screen opposite to the lantern, or by transmitted light.

The full benefit of the illumination was thus obtained.

For lanterns lighted by kerosene oil it undoubtedly brings out the full effect of the weak illumination, and is admirably adapted for small sized pictures.

A New Form of Tin.

A new metal, called by the inventor, Albert Assman, of Rahway, N. J., "assayme," is produced by a special treatment of tin. It has all the good qualities of the latter, can be pressed into any shape, or cast into statuary, or used for plate ware of any description. A beautiful bronze color can be given to the metal, or any shade from bronze to a silver color; and as it does not in the least corrode, it is specially valuable as a silver solder. It melts at a temperature of 432 degrees, or 18 degrees less than tin.