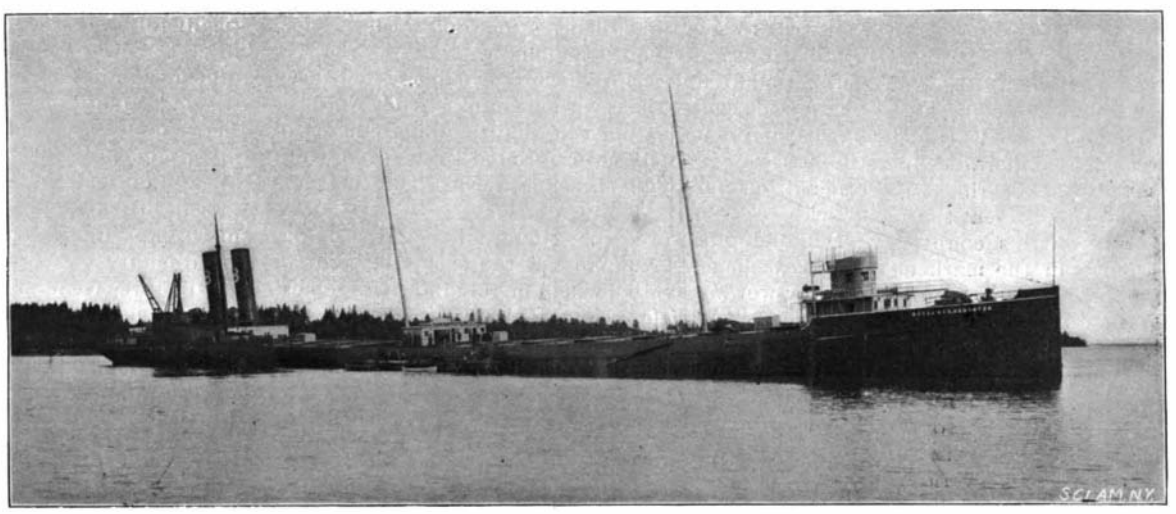
PROBLEMS IN LAKE COMMERCE.

BY WALDON FAWCETT.

The problems involved in the successful conduct of the commerce of the great lakes have grown in complexity within the past few years in a degree fully proportionate to the marvelous extension of the shipping interests of America's inland seas. This year, of all others, the vesselmen were anxious that no derogatory influences should check or retard the flow of traffic, and yet in some respects they have fared even worse than usual.

A moment's consideration of the conditions existent in the commercial and manufacturing world will demonstrate the growing importance of that link in the industrial chain formed by fresh water transportation interests. With almost the entire year 1899 a continuous record of advancing prices in all the commodities of iron and steel, culminating finally in a condition nigh approaching a famine, thousands of men have bent their best energies to moving, from the country bordering on Lake Superior to the furnaces in the vicinity of Pittsburg and the Mahoning Valley, every ton of iron ore procurable for shipment.



WRECK OF THE "DOUGLASS HOUGHTON," SAULT STE. MARIE RIVER, MICH.

Everywhere there has been co-operation in the movement. The mine operators time and again advanced wages in order to compete with the opportunities afforded to labor by the harvest fields of the Northwest; the railroads which carry the ore from the mines to the boats and from the boats to the furnaces have worked energetically to prevent a car famine; and the dock plants which load the ore at one end of the lakes and those which unload it at the other have been operated day and night. After all, however, the final responsibility rested with the vesselmen.

To be sure, the shipping interests have been well paid for the energy which they have displayed. The stringency of the demand for the movement of ore forced up the freight-carrying rates by rapid jumps to a point where the charges for the movement of a ton of ore or coal were three or four times what they had been at any time in years. On the basis of a $2 per ton freight charge on ore, one of the largest type of steel vessels now in service on the lakes is able to net her owner pretty close to $15,000 for each trip; and when it is remembered that under ordinary circumstances a vessel will make at least twenty round trips in a season, it will be seen that the profits of a fleet of half a dozen vessels for the year 1899 may amount to a very tidy sum, even if the craft simply carry ore on the trips down the lakes and return "light," as the vesselmen say. Then, too, the owner, if he desired to consume a few days in loading and discharging cargo, has had no difficulty in securing cargoes of coal to take back up the lakes at a rate of anywhere from 50 cents to $1 per ton.

The chief obstacles to the smooth conduct of great lake commerce continue to be found, as for years past, in delays owing to low water and inconvenience arising from accidents to vessels in the narrow tortuous passages which connect several of the lakes. Instances of the former have been particularly numerous this year, owing to the disposition of vesselmen to load their boats as deeply as possible, but of this I shall have a word to say later.

The lessons of the present season upon which particular emphasis has been placed are those illustrative of the disadvantages attending accidents to boats, which by their character proved a general menace to navigation. Lakes Erie and St. Clair, St. Clair and Huron, Huron and Superior are connected by rivers and canals, so narrow in spots as to barely permit of the passage of boats bound in opposite directions. The work of getting these channels properly buoyed and lighted has been a long drawn out effort for the vesselmen, but it is now all but completed. On its very heels, however, the advent of the larger boats which have been brought by the new era of lake shipping discloses a new danger in the narrowness of the streams.

The seriousness of the situation was brought forcibly to the attention of the people having to do with fresh water commerce by an accident about the middle of September, which was unique in the history of navigation on the inland seas. One of the busiest places on the whole chain of lakes is the Sault Ste. Marie River, which connects Lakes Huron and Ontario and through which there is transported each year more tons of freight than pass through the Suez Canal. At the time above mentioned the channel of this river was completely blocked at one of its narrowest points by the sinking of the great steel steamer "Douglass Houghton." Many times previously had a boat sunk in the channel of the Detroit or St. Mary's River compelled other craft to creep past her carefully, but never before was the whole commerce of the inland seas suspended by a complete and effectual blockade.

The "Houghton," which is one of the fleet of vessels owned by John D. Rockefeller, is upward of 500 feet in length, ranking as one of the largest freighters on fresh water. Passing down St. Mary's River she was towing the barge "John Fritz," a vessel almost as large as herself, and together they carried over fifteen thousand tons of ore. In making a sharp turn at a bend of the river the vessels collided and the "Houghton" sank, her huge bulk reaching from shore to shore. Although no expense was spared in the effort to expedite the wrecking operations on the sunken craft, the passage was blocked for almost a week, and in that time there gathered in the narrow river the greatest fleet which ever assembled on the great lakes and one of the most remarkable ever seen in America. In the more than two hundred vessels huddled together were represented almost every type of craft engaged in traffic on the lakes, and the forest of masts was almost as dense as the woods which extended to the water's edge on either side.

The breaking of the blockade was full of dramatic incidents. After wreckers and divers had worked day and night for some time it was decided to resort to dynamite, and even then successive charges were required before the limestone rock which held the boat was blown asunder. When the "Houghton" finally moved down stream she tore out like twigs the trees on the bank to which had been attached a twelve-inch hawser.

Clearing the channel proved, however, to be but a portion of the task, for thereafter came the management, within the confines of a winding river, of a fleet of two hundred of the largest craft under the American flag, save a few ocean liners. Officers of the United States revenue cutter service were placed in charge, and under their direction was formed the great procession of boats which, on the morning of the raising of the blockade, stretched out for more than forty miles from the scene of the wreck.

It is estimated that the blockade entailed a loss to lake shipping interests of fully a million dollars, and that the wrecking operations represented an expenditure of $100,000. The fleet which was delayed carried in the aggregate three hundred thousand tons of ore, twelve million feet of lumber, and nearly a million bushels of wheat. In its effect the blockade is bound to be far reaching. Already the shipping interests are preparing to make a most vigorous campaign before Congress for an appropriation to make navigable for the largest vessels a second channel in St. Mary's River, which up to this time has been utilized only by the smaller vessels. Between Lakes Huron and St. Clair is a ship canal where an accident such as occurred in St. Mary's River is a constant menace, and the project for a second channel here, which has been discussed for some time, will now be agitated with greater vigor than ever.

"WHALEBACKS" IN THE GREAT BLOCKADE, SAULT STE. MARIE, MICH.

Another great problem which the commercial interests of the lake region can no longer evade is that of the necessity for deeper water. Even as the great fleet, released from the blockade above mentioned, were hurrying in a mad race to make up lost time, many of them were delayed for hours by low water in the Detroit River. Moreover, the past two years has witnessed a scramble on the part of the great iron and steel producing interests to secure control of the tonnage on the lakes and build new. The new boats for which they have let contracts are interesting because they are in the neighborhood of five hundred feet in length—a size which, it was asserted a few years ago, would never be reached on fresh water; but more import-

ant still is the certainty that these new monsters, if fully loaded, will draw more water than is at present to be found in many spots.

Much thought has been given to this subject of late, and it has resulted in an entire revision of opinion. Heretofore the accepted policy has contemplated a deepening of channels by dredging, and millions of dollars have been expended in the work. Now comes the deep waterways commissiom—a body appointed by Congress several years ago—and declares for a great dam in the Niagara River. The commission makes the assertion that the expenditure of a million dollars for this dam will raise the level of Lake Erie three feet, Lake St. Clair two feet, and Lake Huron one foot. The practicability of the scheme seems to have been fully demonstrated, and a great effort is to be made to induce the next Congress to authorize it.

Even with these two main issues disposed of, other problems come crowding thick and fast. The plan of the railroads to bridge the Detroit River, at Detroit, which has been fought by the shipping interests for years, will soon come up again. A private corporation wishes to divert some of the water of St. Mary's River for power purposes; and, finally, a project has been mapped out for the construction of a canal from Lake St. Clair to Lake Erie, in Canadian territory. Any of these enterprises might seriously endanger navigation interests, and probably the next two or three sessions of Congress will witness some fierce contests with the development of the fresh water marine as their text.

German Sugar Production, 1898-99.

According to a statement published in the Reichsanzeiger of August 12, the quantity of refined and manufactured sugar produced in Germany during the campaign year 1898-99 (August 1, 1898, to July 31, 1899) was 1,186,686 tons, as compared with 1,207,350 tons during the campaign 1897-98. The quantity of raw sugar produced was 1,515,526 tons in 1898-99, against 1,664,268 in the preceding sugar campaign. The quantity of raw beets used in sugar manufacture is stated to have been 12,144,291 tons in 1898-99, and 13,697,891 tons in 1897-98.

AN AUTOMATIC HOOP AND BASKET STRIP CUTTING MACHINE.

The accompanying engraving represents a new automatic machine for cutting hoop and basket strips, which has been designed by the Defiance Machine Works, of Defiance, Ohio. The machine is arranged to prevent backlash and to reduce the noise of the rapidly moving cutter bar.

The machine is supported by a strong frame made of heavy cored sections of sufficient weight to prevent all vibration. Journaled in the frame is a main longitudinal shaft carrying fast and loose pulleys. On this main shaft beveled pinions are secured, meshing with bevel gear wheels, the shafts of which are transversely journaled in the frame. These transverse shafts are provided with eccentrics which support the ends of a sliding cutter bar.

When cutting strips of equal thickness the table is stationary, but when the strips or hoops are to be formed with a beveled side, the table is tilted, so that the blank stands at an angle to the descending cutter.

The table is formed of two transverse bars pivoted at their forward ends and provided with recesses in their sides, engaged by bolts on a link. The link is pivoted to a slide moving in a casing loosely hung on an auxiliary longitudinal shaft connected by gearing with the main shaft. Within each of the casings are cams on the auxiliary shaft. As the auxiliary shaft rotates, each cam raises its slide in order to swing the corresponding table bar into an inclined position for the knife to make a beveled cut. The cam is so formed that the blank on the table is alternately tilted during successive full strokes of the cutter bar, so that each alternate stroke causes the blank to receive a beveled cut.

The gearing connecting the main and auxiliary shafts is so arranged that the table automatically operates in exact time with the cutter.

In order to prevent backlash of the gearing and to diminish the noise, the cutter bar is provided at each end with a spring balance. The cutter bar on a down stroke moves against the tension of the springs so as to assist its return movement and to prevent backlash in the gearing. By using screw plugs attached to the ends of the springs, instead of the usual eyes or loops, the springs are rendered more durable.

THE Chicago City Council has passed an ordinance which provides for the establishment of a board of examining engineers, who will pass upon the qualifications of all applicants for a license to run an elevator. Prior to this action it was shown that most elevator accidents were due to incompetency on the part of the operator.

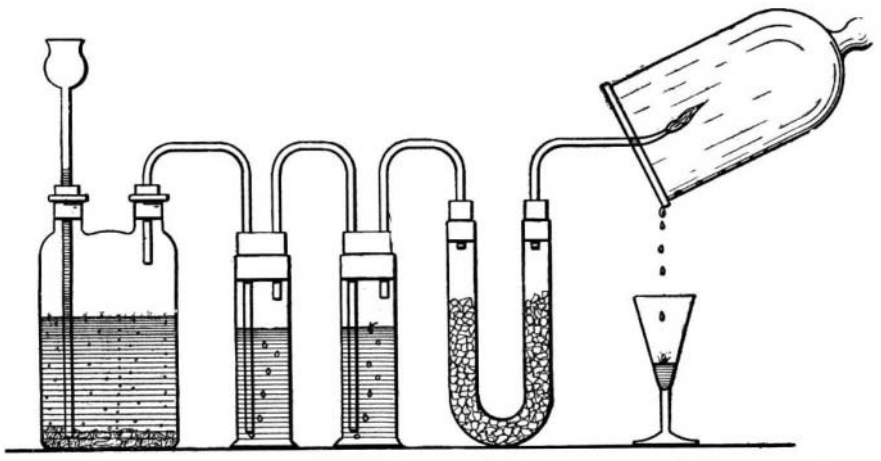


Fig. 1.—FORMATION OF WATER BY THE COMBUSTION OF HYDROGEN.

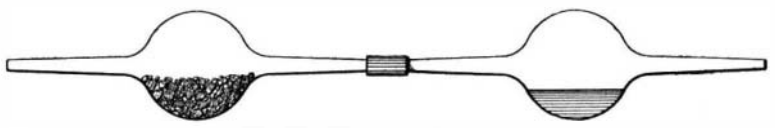
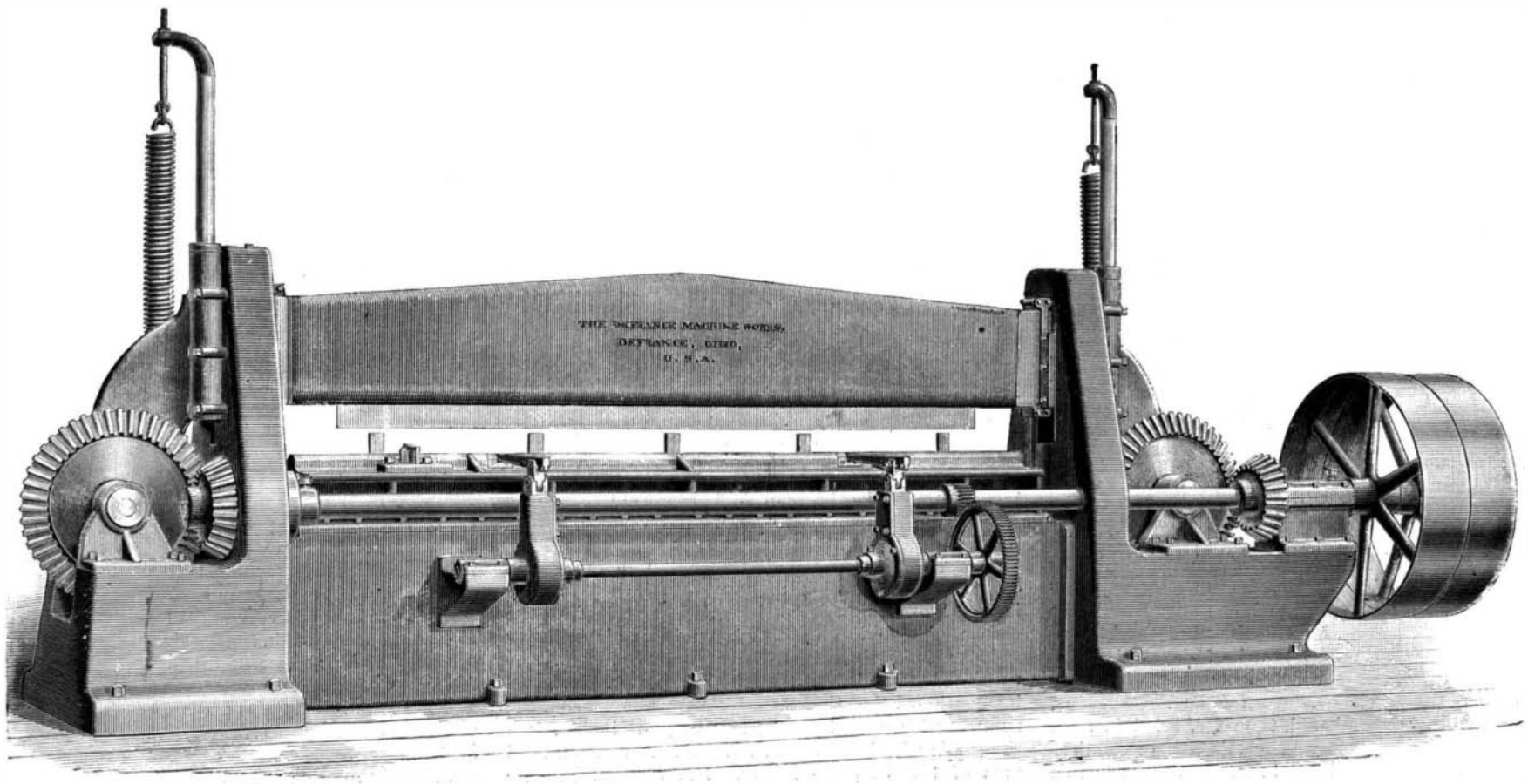


Fig. 2.—SIMPLE ARRANGEMENT FOR ROUGHLY CONDUCTING THE QUANTITATIVE SYNTHESIS OF WATER.

CASES OF "MYSTERIOUS" RUSTING.

BY N. MONROE HOPKINS.

The rusting of iron and steel is a familiar phenomenon to everyone, a source of great trouble and annoyance to those possessing fine instruments, tools, and machinery, and a factor in daily life of no mean economic importance. It is the purpose of this brief writing to point out to those who have not given attention to scientific chemistry the formation of water vapor by the combustion of gas, wood, or coal, and the condensation of the vapor to water when it comes in contact with cold masses of metal. An example will best make the matter clear, and throw light, perhaps, on many cases of apparently mysterious rustings. The writer was shown a screw-cutting lathe completely covered with a coat of rust, and asked to explain, if possible, the cause for the sudden change, and the source of water, when the tool had been in perfect condition ever since its installation, the polished steel work having been bright and apparently beautifully kept only forty-eight hours before. The building was perfectly dry, with no indications of moisture either inside or out, yet the lathe was so thoroughly oxidized that it presented the appearance of iron-work which had been exposed to a dense sea fog. Owing to the suddenness of the change, and to the fact that a number of other smaller tools which had always been in a well polished condition were also badly rusted, the source of water, and the case, seemed surrounded with mystery. It was learned by the writer that a gasoline furnace had been in prolonged use by some plumbers several days prior to the discovery of the rust for the purpose of melting pots of lead for making leaded joints. This furnace had been placed directly upon the floor, 10 or 15 feet from the lathe, with no chimney or other means of ventilation. The water vapor resultant from the combustion of the gas from the gasoline found a most approved condenser in the polished steel of the lathe, the surface of which it immediately converted into rust. As will be shown by the following experiments, water is a definite product of combustion, and should it prove necessary to burn gasoline, wood or charcoal, in the presence of polished steel, it should be protected with a cloth covering, or a coating of oil, and the products of combustion should, in addition, be led to a chimney, or other suitable exit to the atmosphere. Of course in some buildings where there is a good draught of air, the water vapor is less liable to collect, and condense. The writer has had valuable articles, such as large steel plates, badly rusted by leaving them in a badly ventilated room, with the city illuminating gas burning from the common gas fixtures. A couple of experiments on the formation of water by the combustion of gas in the atmosphere may prove of interest to those who have not had opportunity to have observed the synthesis of water in a chemical laboratory. The simplest experiment which any one may perform is to hold a thick, cold metal plate in the flame of a Bunsen burner, or alcohol lamp.



AUTOMATIC HOOP AND BASKET STRIP CUTTING MACHINE.