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.

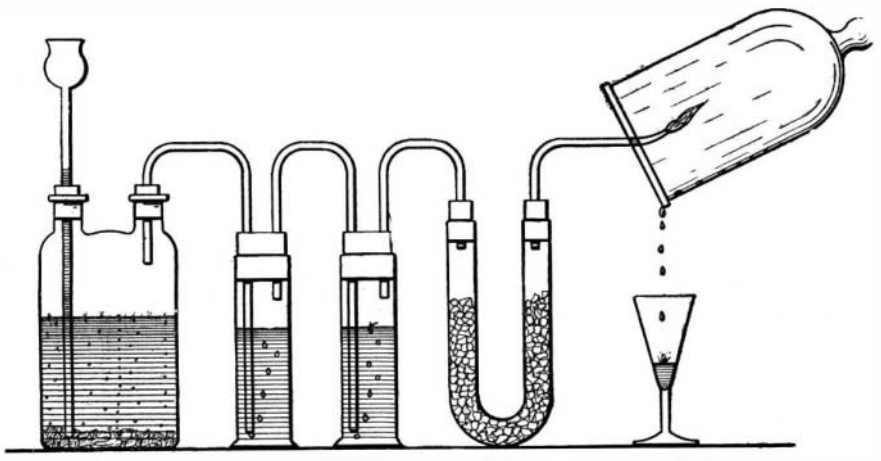


Fig. 1.—FORMATION OF WATER BY THE COMBUSTION OF HYDROGEN.

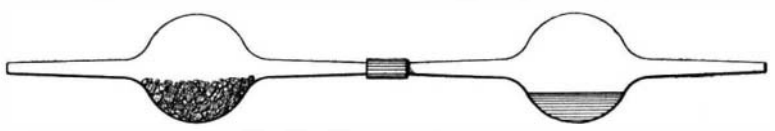
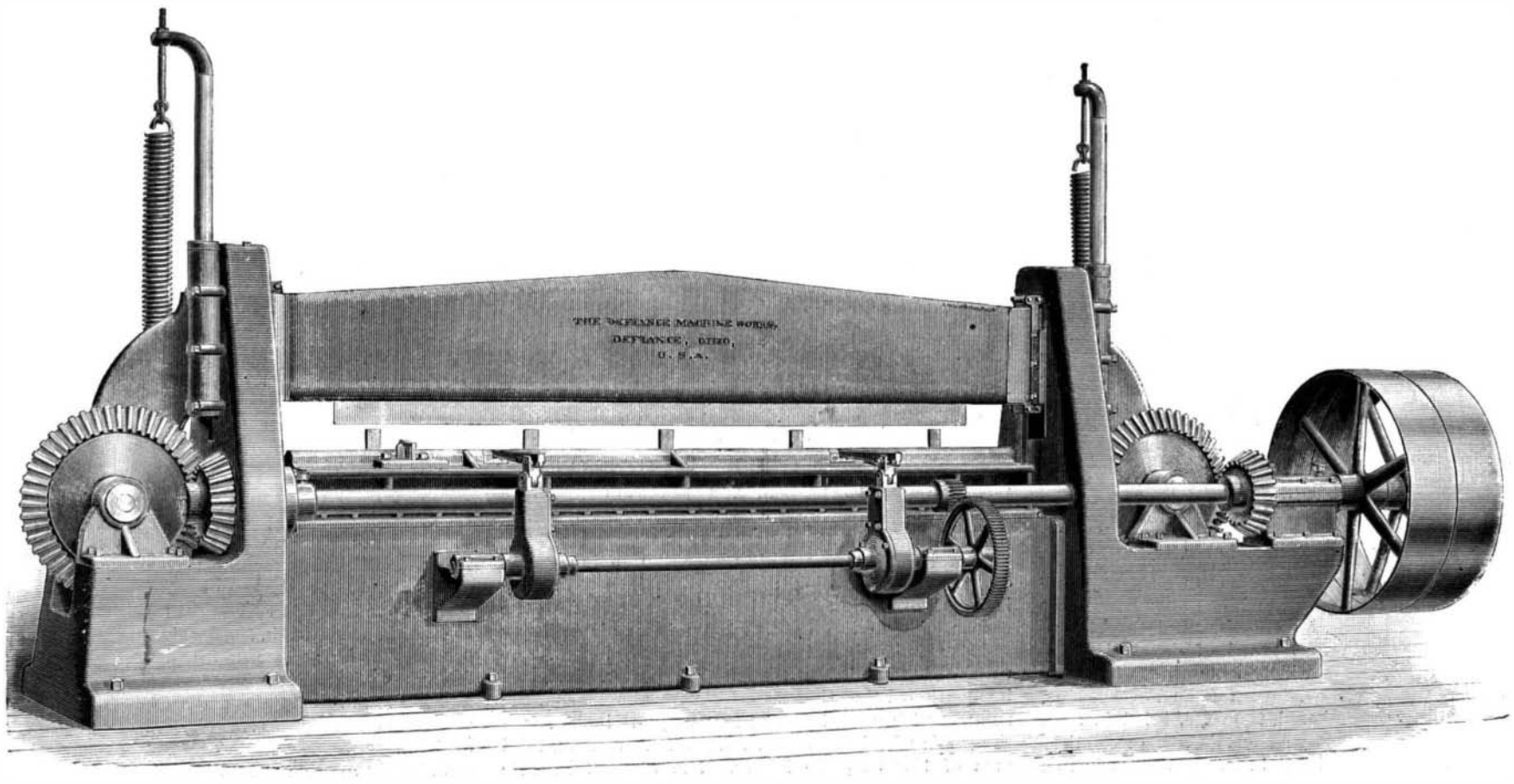


Fig. 2.—SIMPLE ARRANGEMENT FOR ROUGHLY CONDUCTING THE QUANTITATIVE SYNTHESIS OF WATER.

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.