is no thought of restricting the membership to lawyers, but the idea is to insure proper representation of the rights of applicants for patents. The essentials for practice before the office having been determined on, and the conditions for the issuance of a license or diploma being fixed, none save those holding such license or diploma should be eligible to appear as attorneys in the prosecution of patent cases before the office. Such an association could take cognizance of practices over which the Patent Office would have no jurisdiction and could punish offenders against common professional morality. Such a course of common self-defense has been found necessary in England, and resulted in the establishment some few years ago of the Chartered Institute of Patent Agents.

The necessity for such an association arises from the very limited powers of the Commissioner of Patents in disqualifying those who are known in the profession to be disreputable and dishonest. Stories constantly reach us of inventors who have lost their fees or who have had their interests jeopardized or their patents lost at the hands of irregular attorneys; but the Patent Office, although perfectly aware of the practices of such attorneys, is not able to protect such victims or punish such offenders, as the latter are sufficiently clever not to commit an act of "indiscretion" after the Patent Office has jurisdiction over the case. The Commissioner has pointed out in his report the only solution for these abuses, and the establishment of a patent bar would elevate permanently the standard of the profession, and would redound alike to the advantage of the profession and to the great mass of inventors, who number many thousands, and who deserve to receive every protection from harm and imposition.

THE RIVER AND HARBOR BILL.

The River and Harbor Bill has been passed over the President's veto in the House by a vote of 220 to 60, and on the following day it was similarly passed in the Senate by a vote of 56 to 5, the vote in the House being taken without any debate, that of the Senate being preceded by a debate of four hours. There is one important feature of the bill that has now become law which will commend itself to all engineers who have had any practical experience in river and harbor improvement: we refer to the provision which it makes for the letting of the whole of a contemplated scheme of improvement by contract, and the authorization of the expenditure of the whole sum necessary to carry it out.

It is safe to say that there is no department of public works in which the old system of executing work by piecemeal has proved more extravagant and wasteful than in this. In river and harbor improvement the exigencies of the case generally demand that the work shall be pushed through with dispatch. To place a certain sum of money at the engineer's disposal, and tell him to go ahead and do as much as he can with it, is in some cases to invite disaster. This has been proved time and again in the construction of jetties, training walls, revetments, etc., where the construction of the trestle, mattress, or other preliminary and more or less unstable structure has necessarily to precede and keep well ahead of the stone riprap and ballasting which is subsequently added to give it stability. It has been a common thing for the harbor jetty, which has been built in the summer, and left without rock ballast because the year's appropriation had run out, to be swept away by the winter's gales. Moreover, the intermittent system of work involves the idleness and depreciation of a vast amount of valuable plant, which under the present arrangement will be kept continuously at work.

It is unfortunate that the annual report of the engineers in charge of this branch of work, or at least a brief digest of it, is not more widely read by the public at large. The mere recital of the vast improvements which have been made in both harbor and river navigation would make the large sums annually asked for this work appear more reasonable and less extravagant than they are popularly supposed to be. A few feet more depth of water on an ocean bar, or as many inches gained on the gravel bar of an inland river, will mean many thousands of tons increased capacity for the channel or river in question, and an enormous advance in the trade of the districts which are served thereby.

COAST DEFENSE.

The nation has received another emphatic reminder of the necessity for improved coast defenses in the shape of a statement by a member of the Senate Committee which recently inspected the fortifications of the port of New York. At the close of the inspection Senator Squire stated that the committee was instructed "to visit and examine the harbor defenses of the city of New York, it being known that the port of New York was better protected than any other of the twenty-seven ports from Portland, Maine, down." At Sandy Hook they found "just two of the direct fire guns in readiness for firing." There were "sixteen mortars ready for placing, but without conning towers or rangers." At Fort Wadsworth there were "five 8 inch guns, not yet emplaced, and it will be some time before they are ready. At Fort Hamilton" the committee "found a 10 inch gun not yet mounted." The senator drew attention to the fact that "few people stop to think an enemy can come in through Long Island Sound and Hell Gate." On the Sound they "found at Willets Point two 10 inch guns not yet emplaced," and three or four 8 inch guns. "Here is the seat of the great torpedo school, having the only complete casement in the United States." The torpedo arrangements are very complete; and "they undoubtedly form a most deadly defense, if properly protected with guns; but they are not protected."

As compared with the above mentioned guns already on the ground, "the committee in its report will say what is absolutely needed for the defense of New York. First of all, ninety-three direct fire 8, 10, and 12 inch long range, high power guns. In addition to these, one hundred and seventy-six 12 inch steel rifle mortars and twenty-five rapid fire guns."

Such is the present condition of the New York defenses, and New York is the best defended of the twenty-seven ports. It must, moreover, be remembered that the building of high power guns and the preparation of emplacements is the work of years. "If all the manufacturing facilities now available were put into use, it would be impossible properly to fortify New York alone in less than three years." Of all the contemplated national expenditures none is more urgent than this, for there is no other point at which an enemy could deliver a blow with such immediate and lasting effect. The spirit which prompts military preparations of this kind is not aggressive, but, as its name indicates, strictly defensive, and therefore pacific.

In view of the statements of Senator Squire, it is gratifying to note that the agreement just reached by Congress on the Fortifications Bill gives the country by far the most liberal appropriation for coast defense ever made. The bill now carries $11,572,964, of which $7,377,888 is an outright appropriation and $4,195,076 an authorization of contracts. We note, moreover, with pleasure, that the House and Senate conferees have provided for the manufacture of a 16 inch gun, being prompted thereto by the consideration that improved methods of manufacture will enable us to turn out a reliable gun of this caliber, and that its superior smashing effect upon hard-faced armor renders it a desirable weapon for coast defense. The arguments in favor of these large guns will be found in detail in our issue of May 30.

Superheated Steam.*

The practical difficulties in the way of realizing the promised economical gains resulting from the use of superheated steam have thus far more than balanced the advantage derivable by its application in all ordinary and usual cases. It was at one time the most attractive and common field of invention.

Of the four principal and recognized methods of reducing that waste which comes of initial, or cylinder, condensation—compression, jacketing, compounding, and superheating—the last named, could all mechanical difficulties be overcome, would be by far the best and most effective. The two kinds of difficulty to be overcome are those attending the construction of a superheater incapable of injury by the process of superheating and the introduction of the required and variable amount of superheat at the engine without injury to cylinder, piston, valves, or packing.

The boiler, as well as the cylinder, is the gainer by superheating, for the reduced expenditure at the cylinder means less demand upon the boiler, and the added heating surface at the superheater gives a still further gain.

The economical effect of a small amount of superheat is seen in the securing of dry steam at the engine and in the reduction of cylinder condensation, and, if the superheating be carried far enough, the engine is transformed into a superheated steam engine. The effect of superheating, so far as employed in the steam engine, ordinarily, is the checking of heat waste by initial condensation. The real limit of gain at the engine is found when the gain by reduction of initial condensation reaches its economical maximum. A more serious difficulty is found in constructing superheating apparatus that shall be safe, adjustable to the varying demands of the engine, and costing little for maintenance.

The economy of superheating comes of the fact that it is possible to reduce the waste of condensation by the expenditure of but a fraction of the amount of heat in superheating the charge that would otherwise be expended through such condensation. The application of one thermal unit in superheating invariably saves several units of heat which, with saturated steam, would be stored temporarily in the metal of the cylinder, to be later discharged without performing its share of the work. "The limit in superheating is, today, considered to be practically somewhere inside of 500° F. or within a range of not much above 100° F. above the usual maximum temperature of saturation." The results of some fifty authentic and well conducted experiments show that the gain in fuel ranges from ten to fifty per cent of the fuel used with wet steam; that about 100° F. gives complete extinction of initial condensation; that even fifteen or twenty degrees will make an important gain in reduction of internal wastes; that every discreetly applied use of this system returns from two to ten times its cost in heat expended; and that the indications are, judging from past and present practice, that good engineering in this direction pays well. The average of fifty-two cases observed by the writer gives a gain of twenty-six per cent with a superheat of 105° F.

Taking an average case in which the quantity of heat brought over from the boiler is 1,100 B. T. U., and twenty-five per cent condensation occurs at entrance into the cylinder, the heat wasted per pound is 275 B. T. U. To supply this amount of heat by superheating the steam would demand an increase of temperature of 570° F. The economy is measured by the difference between this equivalent of the waste and the quantity of heat expended—wasted in a certain sense—in its reduction.

The conclusions of practical importance are:

1. Superheated steam, as hitherto employed in the steam engine, has absolutely no thermo-dynamic value. The value of the maximum measure of ideal efficiency, $(T_1-T_2)\ T$, is in no manner altered by its introduction into the system.

2. Superheating has for its sole purpose and result in the steam engine to-day the reduction of the internal thermal wastes of the engine, consequent upon the phenomenon known as initial or "cylinder condensation." Here it is extraordinarily effective, and a small quantity of heat expended in superheating the entering steam effects a comparatively large reduction in the expenditure of steam in the engine.

3. Superheating is superior to any other known means of reduction of internal waste, such as jacketing; while the multiple cylinder engine has also its limitations.

4. The introduction of metallic packings and of high test lubricants has enormously reduced the difficulties resulting from destruction of packing and decomposition of lubricants under the action of superheated steam.

5. The low temperature of gases in the uptake of modern boilers, while it lessens the difficulty of destruction of superheaters by heat, necessitates a correspondingly large area of superheating surface. One of the most serious and attractive problems for the engineer to-day is the production of a superheater which will withstand gases of high temperature, transfer their heat to steam, and have a reasonably long life.

6. Small engines will gain by superheating more than large, slow engines more than fast, and simple engines more than multiple cylinder systems.

7. The larger the waste to be checked in the engine, the farther should the superheating be carried.

8. The extent of superheating should be adjustable—not only to the particular size and type of engine in view, but also in the same engine—to the extent to which expansion is carried.

9. The average simple engine consumes an annual amount of fuel about equal in value to its own first cost. Five dollars being returned in saving to each dollar paid for superheating, it will pay annually to expend the full equivalent of the interest on the price of the engine in maintaining a good superheating system. When, however, as has hitherto usually happened, this account includes such large interest and wear and tear accounts as cause the total annual expense to exceed this financial limit, the engineer will wisely decline to thus invest capital.

10. Given an efficient superheater, and the engineer can adjust his temperature and pressures of working fluid to the character of material in boiler and engine, and secure the best adjustment of the thermal to the dynamic limit.

11. This is to-day the greatest problem presented to the designing and constructing engineer, unless it be that of rendering the interior of the cylinder non-conducting, so as entirely to prevent initial condensation, thus making the steam engine a purely thermo-dynamic machine.

*Abstract of a paper by Prof. R. H. Thurston before the St. Louis meeting of the American Society of Mechanical Engineers.