

will be practically effected by those who have been so long working to debase the currency of the country. The best evidence of the hopelessness of their task is to be found in the steadily declining price of silver, and, although the silver agitation may continue for some time yet, the possibility of its again becoming a vital issue grows more distant with each improving feature of the business situation. Confidence is of slow growth, but it is evident that it is now the dominant feature in business circles generally.

#### A SUCCESSFUL SOLUTION OF THE LOCOMOTIVE COUNTERBALANCE PROBLEM.

The Purdue University locomotive testing plant has recently concluded a series of tests which will rank high in interest and value among the many which have been carried out since it was first put in operation. As most of our readers are aware, the apparatus has been designed for the purpose of subjecting full sized locomotives to test under conditions which shall be as far as possible identical to those which obtain in actual service on the road, and the data which is so secured has the double value of a trial which is at once practical and scientific—all the possibilities of error being eliminated with the care which distinguishes laboratory work.

The tests to which we refer were carried out upon a locomotive which was designed for the purpose of overcoming the old-time and apparently insuperable difficulties attendant upon counterbalancing. What these difficulties are is so well known as scarcely to call for repetition here; but the effects of faulty counterbalancing are not so generally appreciated. How destructive these effects may be, how costly to the railroad companies in repairs both to rolling stock and to track, may be judged from the fact that a poorly balanced freight engine running at high speed over a stretch of track has been known to bend the steel rails into a series of hollows, and in some cases break them altogether.

The counterbalance difficulty arises from the impossibility of balancing the moving parts (crank pins, connecting rods, pistons, etc.) which are attached to the driving wheels, so that the center of gravity of the wheels and the attached parts shall coincide with the axis of the wheels. The revolving parts (crank pins, part of connecting rods, etc.) may be balanced to a nicety by placing weight on the opposite side of the wheel; but the reciprocating parts (part of connecting rod, the crossheads, piston rods and pistons) cannot be so balanced for the entire revolution of the wheel. For if, after the revolving parts have been provided for, counterbalance weights be added whose momentum will be equal to the momentum of the reciprocating parts when the latter are at the half stroke and traveling at their greatest speed, it is evident that when the crank is on the dead center and the reciprocating parts are at rest the whole momentum of this counterbalance will be "in excess," as it is called. This excess will increase the pressure of the wheels on the rails on the downward half of the revolution and reduce it on the upper half. Theoretically we should expect that a speed would be reached where the upward momentum would exceed the tension of the springs, causing the wheels to jump clear of the track at each revolution. It was suspected that this variation of pressure of driving wheels on the rails occurred in practice, and the various tests at Purdue University have shown that such alternate "hammering" and lifting actually takes place.

If all the reciprocating parts are balanced, there will be destructive vertical hammering; if none is balanced, there will be longitudinal disturbance, producing an uncomfortable tremor throughout the train and badly racking the locomotive. To meet the difficulty, or rather to moderate it, locomotive builders have taken a middle course, and, while balancing all the revolving parts, they have balanced only a portion—usually 70 per cent—of the reciprocating parts. This results in an excess balance of from 400 pounds in the average engine to as high as 800 pounds in some recent heavy compounds. This, in the latter case, is equivalent to the vertical effect of fastening nearly half a ton of metal eccentrically within a wheel which is revolving at the rate of 300 or 400 revolutions per minute. It is little wonder that rails are bent or broken and that the locomotive repair bill is often so heavy.

In the locomotive which has recently been tested on the Purdue plant the difficulty is overcome by the use of four cylinders. These are arranged so that each pair of engines on either side has its cranks set 180 degrees apart, and the reciprocating parts are made to exactly counterbalance each other. A full description, with illustrations, of this engine was published in the SCIENTIFIC AMERICAN and the SUPPLEMENT respectively for November 14 and November 21, 1896. Without going into details, it is sufficient to say that the reciprocating parts of the low pressure engines were designed so as to be of the same weight as those of the high pressure engines, and by placing the cranks at 180 degrees, as stated, the counterbalancing dilemma was entirely removed. In the current issue of the SUPPLEMENT will be found a digest of the test as carried out by Prof.

Goss, of Purdue University. It consisted in running a set of wires between the locomotive drivers and the supporting wheels on which they turned, the theory being that the wires would be flattened in proportion to the pressure to which they were subjected during a revolution of the drive wheels. If the pressure was even, the wire would be even in thickness; if it varied, the thickness of the wire would vary proportionately.

In the tests which had previously been made on the Schenectady experimental engine, which carries an excess balance of 400 pounds, the wire, after passing under the drivers, showed great variations in its thickness, which increased where the counterbalance in the wheel approached the upper quarter of its revolution until its full diameter was reached, "a condition," says Prof. Goss, "which continues through several feet of its length and makes plain the fact that the wheel must have risen clear of its support during a considerable portion of its revolution."

On the other hand, the wires from the balanced locomotive were "nearly of the same thickness throughout."

The report concludes by stating that the data of the test justify the conclusion that the drive wheels of this locomotive "are at all times in perfect balance, that they neither increase nor diminish the pressure with which they act upon the rails as they revolve."

This very creditable result goes to prove that many of the so-called inherent drawbacks of some of the most familiar mechanical appliances are not inherent at all, and may be made to yield to an intelligent treatment of the problem. If it is objected that the new system of balancing involves the use of four cylinders and a multiplication of parts, the question becomes one of expediency and relative cost. The present practice of turning out locomotives carrying an excess balance is admitted to result in a more or less destructive action upon the track and bridges. Not only so, but it shortens the life of the locomotive itself. The Purdue tests indicate that the wear and tear of the track from this cause must always be considerable, and that under locomotives having a considerably greater excess than the 400 pounds carried in the test, and running at high speed, it must be enormous.

To what extent does the cost of repairs to track and locomotives due to excess balance in the present type of locomotive exceed the extra cost of a four cylindered locomotive of the same weight and power? This is a question which may well be commended to the thoughtful consideration of the roadmaster and the master mechanic.

#### OFFICIAL REGISTRATION OF PATENT ATTORNEYS.

We have commented before on the need of more stringent requirements by the Patent Office of persons who desire to practice there in the rôle of attorneys than has heretofore existed, in consequence of the fraudulent practices that have been permitted with regard to applications for patents and their subsequent prosecution. The need of reform in the patent bar, if there is such a thing, has been evident for a long time.

We therefore are glad to note that a step in securing such reform, and which should soon exert an elevating influence on those engaged in soliciting patents, as well as give renewed assurance to the public that it will be honorably and honestly treated, is the new order and amendment to the Rules of Practice, promulgated August 6, 1897, by Hon. Benjamin Butterworth, Commissioner of Patents, which requires a register of attorneys to be kept at the Patent Office. The amendment is so important that we herewith give it in full:

"DEPARTMENT OF THE INTERIOR,  
"UNITED STATES PATENT OFFICE,  
"WASHINGTON, D. C., August 6, 1897.

"Rule 17 of the Rules of Practice, approved June 18, 1897, is amended to read as follows:

"17. An applicant or an assignee of the entire interest may prosecute his own case; but he is advised, unless familiar with such matters, to employ a competent attorney, as the value of patents depends largely upon the skillful preparation of the specification and claims. The office cannot aid in the selection of an attorney.

"A register of attorneys will be kept in this office, on which will be entered the names of all persons entitled to represent applicants before the Patent Office in the presentation and prosecution of applications for patent. The names of the following persons will, upon their written request, be entered upon this register:

"(a) Any person who at the date of the approval of the present Rules of Practice, June 18, 1897, was engaged in the active prosecution as attorney or agent of applications for patent before this office, or had been so engaged at any time within five years prior thereto and is not disbarred, or is or was during such period a member of a firm so engaged and not disbarred, provided that such person shall, if required, furnish information as to one or more applications for patent so prosecuted by him.

"(b) Any attorney at law who is in good standing in any court of record in the United States or any of the States or Territories thereof, and shall furnish a certificate of the clerk of the United States, State, or Terri-

torial court, duly authenticated under the seal of the court, that he is an attorney in good standing.

"(c) Any person who has been regularly recognized as an attorney or agent to represent claimants before the Department of the Interior or any bureau thereof and is in good standing, provided that such person shall furnish a statement of the date of his admission to practice as such attorney or agent, and shall further show, if required by the Commissioner, that he is possessed of the necessary qualifications to render applicants for patents valuable service and is otherwise competent to advise and assist them in the presentation and prosecution of their applications before the Patent Office.

"(d) Any person not an attorney at law who shall file a certificate from a judge of a United States, State, or Territorial court, duly authenticated under the seal of the court, that such person is of good moral character and of good repute and possessed of the necessary qualifications to enable him to render applicants for patents valuable service and is otherwise competent to advise and assist them in the presentation and prosecution of their applications before the Patent Office.

"(e) Any firm which at the date of the approval of the present Rules of Practice was engaged in the active prosecution as attorneys or agents of applications for patents before the Patent Office or had been so engaged at any time within five years prior thereto, provided such firm or any member thereof is not disbarred, provided the names of the individuals composing the firm are stated, and provided, also, that such firm shall, if required, furnish information as to one or more applications prosecuted before the Patent Office by them.

"(f) Any firm not entitled to registration under the preceding sections who shall show that the individuals composing the firm are each and all recognized as patent attorneys or agents or are each and all entitled to be so recognized under the preceding sections of this rule.

"The Commissioner may demand additional proof of qualifications and reserves the right to decline to recognize any attorney, agent, or other person applying for registration under this rule.

"Any person or firm not registered and not entitled to be recognized under this rule as an attorney or agent to represent claimants generally may, upon a showing of circumstances which render it necessary or justifiable, be recognized by the Commissioner to prosecute as attorney or agent a certain specified application or applications; but this limited recognition shall not extend further than the application or applications named.

"After January 1, 1898, no person not registered in accordance with this rule will be permitted to prosecute applications before the Patent Office.

"BENJAMIN BUTTERWORTH, Commissioner.

"Approved:

"THOMAS RYAN, Acting Secretary of the Interior."

The advantage of this rule to the general public is that before intrusting business to an attorney a person may ascertain from the Commissioner of Patents whether such attorney is on the Patent Office public register. An affirmative answer would convey the inference that the attorney could be depended upon to deal with his client honestly—an assurance which is now lacking, yet which should in the future bring the patent practice up to a higher and better level. All reputable attorneys should at once endeavor to have their names registered and assist in establishing this needed reform. Commissioner Butterworth certainly deserves the thanks of the public and of the patent attorneys in particular for the promulgation so promptly of this excellent amendment.

#### Ocean Voyage by a Stern Wheel River Steamer.

We are informed by Frank S. French, of San Francisco, Cal., that during the past month insurance and seafaring men have been speculating as to the outcome of the proposition to bring a stern wheel river boat, the H. C. Grady, down the coast from Astoria, Ore., to San Francisco, Cal.

At a glance it will be seen that a flat-bottomed, top-heavy and unwieldy craft, built to run on smooth water, with guard scarcely two feet above the water, and further encumbered by a heavy stern wheel, is not a very inviting risk either to underwriters or crew when a voyage of the better part of a thousand miles down a treacherous coast is to be undertaken.

After many delays a start was made, and for five days this unseaworthy hulk battled against head winds and high seas, but to the surprise of many actually succeeded in making port under her own steam. The success of the venture is largely due to the skill of the master, Capt. Denny, an old-time sea captain, well known on the Pacific coast.

It is doubtful if a stern wheel steamer of this class ever made an ocean voyage before, unassisted by other vessels.

ACCORDING to experiments recently conducted by Messrs. Holborn and Wien, the electric resistance of platinum theoretically sinks to 0 at  $-258^{\circ}$  Centigrade. —L'Industrie Electrique.