study and research. At present about thirty-five specifications of this kind have been formulated, and all the materials to which these refer are bought to conform thereto. When the material is delivered samples are sent to the testing department, properly labeled, and designated by the number of the requisition under which it was ordered, and none of the material can be used, excepting in emergencies, until the samples have been inspected and analyzed to ascertain whether they comply with the specifications. As soon as the analyses are made reports thereon are sent to the superintendent of the motive power department, and the holders of the materials are duly notified whether it does or does not comply with the requirements. If it does it is accepted and used, if not the parties who supplied it are notified and it is returned to them. Some of the materials are subjected to both chemical analysis, and to physical tests before being accepted. The ascertainment of the qualities and characteristics, which all these different materials should have of course, implies as has been said an immense amount of special knowledge, and these which have been prepared were evolved as the result of the work of this unique department of the Pennsylvania railroad during the many years of its existence and are the results of much labor, research and experience. The great variety of materials which are bought by and are sold to railroad companies are, of course, subject to all kinds of deterioration, adulteration and falsification. Sometimes this arises from the ignorance of dealers or manufacturers; in others it is more culpable. It is the business of the testing department to ascertain whether the materials bought have the qualities required. There are, of course, some things which require only to be inspected, and not tested, and for that reason inspectors are employed, but these belong chiefly to the physical test department, and are sent wherever their services are required. That a private individual firm or a great company will be liable to be cheated if it does not know what kind of materials are supplied to it, or if its knowledge of what it gets is supplied only in a very casual, desultory and unsystematic way, would hardly appear to require any proof. The Pennsylvania Railroad Company has organized its test department in a thoroughly systematic manner to do what every prudent business man does when he buys anything. The magnitude of the transactions of the railroad company of course requires that the organization and scope of this department should correspond thereto in order to accomplish its purpose. In another article a fuller detailed description will be given of the work which has been and constantly is being done, with some reports of the results which have been accomplished thereby.

(To be Continued.)

Communications.

Sensational Tests of Car Weeels.

EDITOR AMERICAN ENGINEER, CAR BUILDER AND RAILROAD JOURNAL:

The interesting account on page 92 of your June issue of certain "thermal tests" of car wheels, made at Altoona, is calculated to excite alarm and to weaken confidence in cast-iron car wheels.

A little reflection will, I think, convince those who are familiar with the manufacture and use of car wheels that this test is entirely unlike any conceivable conditions, even of severest service. Prolonged action of brakes cannot approximate such a condition, although car wheels are frequently observed to be *very much hotter*, when examined at the bottom of a long descending grade, than your account shows sufficed to crack the test wheels, without any evidence of cracking in plate or brackets.

Pouring an annular lake of molten iron around the rim of a car wheel does not, at all, imitate the condition which obtains when brakes are suddenly and continuously applied, therefore no proper deductions can be drawn therefrom; though the *prima facie* reason why one wheel cracked under such a test and another did not, would appear to be that the cracked wheel had a deeper chilled tread and would, therefore, have proved a more serviceable wheel for the purpose for which it was designed, viz., to show good mileage in actual service.

Some years ago the wheels made at Altoona were cast by what was then called the "sand-flange process," and wheels cast in this way would, presumably, resist this extraordinary "thermal test" better than similar wheels cast in a chill not provided with the sand flange.

In 1881, when I last visited the Altoona shops, the sand-flange power process had been in daily use for more than five years and it would no doubt be equally applicable to contracting chills which are now generally used.

This process is simply providing a groove about ⅝ inches wide, ⅝ inches deep in the flange portion of a chill; this groove is filled with sand, properly packed to preserved the shape of the flange and an annular chamber about ⅛ inch wide and ⅛ inch deep with a few vent holes to carry off the steam generated in the sand rammed in the groove, while casting the wheel.

The practical effect of this arrangement was to decrease the chill of the flange of the wheel, without affecting the depth of chill on the tread. This difference would probably be sufficient to prevent the occurrence of a crack through the flange, which would, of course, immediately cause a crack in the brackets, followed by a crack through the plate.

I do not know whether the Altoona wheel was cast in this manner, or whether it was deficient in chill, but I regard the test as a sensational and misleading one, representing impossible conditions and likely to cause unnecessary alarm unless properly understood.

Not having been connected with car-wheel manufacture since 1887, I feel free to criticize this test. C.

[Our correspondent's observation that "the *prima facie* reason why one wheel cracked under such a test, and another did not, would appear to be that the cracked wheel had a deeper chilled tread," it is to be feared is a mere hypothesis, and may or may not be true, but is valueless as a basis for drawing any reliable deduction. Whether the wheels which were broken were or were not cast with a sand flange we are not able to say, neither do we know whether that method of casting "would probably be sufficient to prevent the occurrence of a crack through the flange." In cases like this it is well to keep in mind the maxim "that things which are not quite sure are very uncertain." Nor is it quite clear why the test referred to should be regarded as "sensational." That car wheels break when their rims are suddenly heated to comparatively low temperatures is surely a fact of importance in view of the experience, which is not uncommon, of more or less mysterious breakages of wheels in service, attended at times with loss of life or limb, and always by loss of property. It would or should be more sensational if such a fact did not receive very serious consideration by those who are interested with the responsibility of carrying us safely when we travel on railroads.—EDITOR.]

Indicator Rigging for Locomotives.

EDITOR AMERICAN ENGINEER, CAR BUILDER AND RAILROAD JOURNAL:

There is a mistake in the latter part of the article in your June issue on the Indicator Rigging used on the Pennsylvania Railroad, where it is stated that the rigging illustrated is the development of one used by Professor Goss, whereas it is the development of one first used and illustrated by Mr. Dean or George Strong.

I send you with this letter prints showing the general arrangement and details of our latest rigging, which is a modification of that used by Professor Goss. It was made for use on our new mogul compounds, as the pantograph rigging was not adapted to the increased stroke and higher steam chests of the compounds. The pantograph rigging is an accurate one and has been used at speeds over 80 miles per hour, but service has shown it to possess two disadvantages:

First. The workmanship has to be very excellent to prevent lost motion.

Second. It is too flexible laterally, and the side tremors set up are communicated to the motion rod, and thence to the indicator drum.

The motion shown in the blue prints sent you is an equally accurate and much simpler one, and, as will be noticed, uses several parts of the pantograph motion.

Trial shows that it wears better and is not subject to the same vibration as the other motion, but has not the same range of vertical adjustment. It has provision for taking up the wear where necessary, and the steam-chest bearing for the motion rod is much

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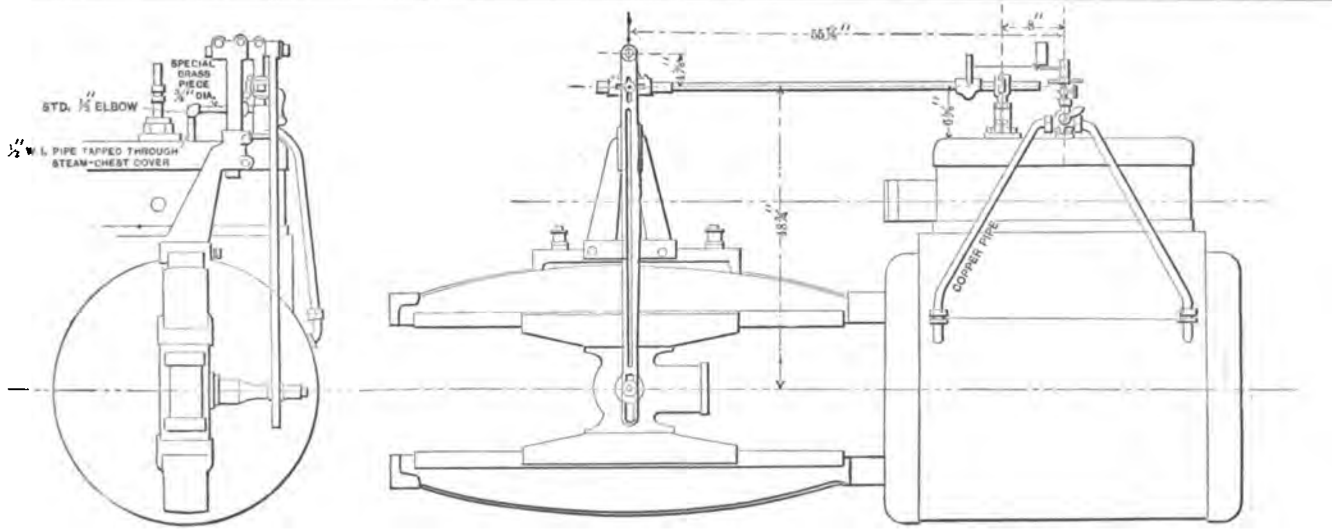
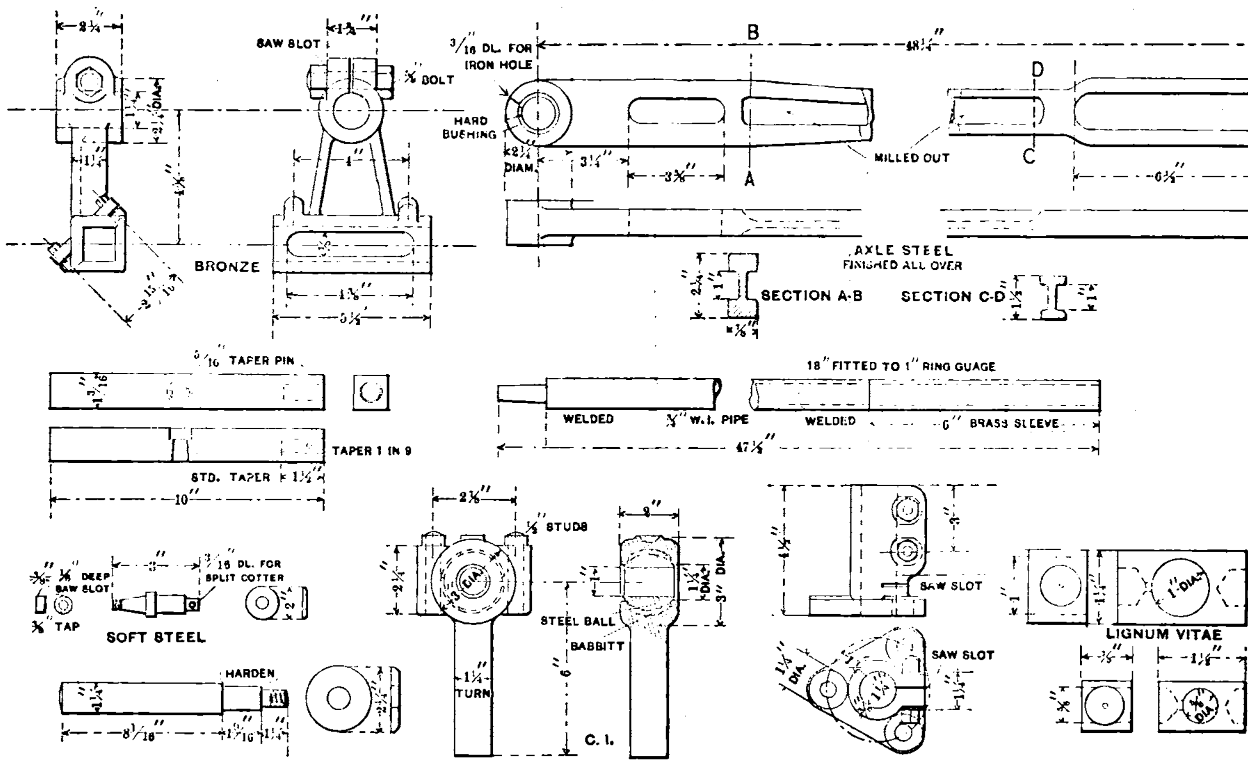


General Arrangement of Indicator Rigging.



Details of Indicator Rigging.

better than that illustrated by you in June. Brass sliding blocks in the slots of the lever were found to wear too fast, and have been supplanted with others of lignum vitæ, which wear very much better. The details are so plain as to need no explanation.

For engines with a short stroke and high steam chests, the fulcrum of the lever could well be placed between the slots, and would allow a much shorter and stiffer stand, but the angle of the slots to the line of motion would be less favorable, and there might be some trouble from sticking.

In conclusion, I think that where it is necessary to adapt one rigging to a number of engines of different types, the pantograph motion is to be preferred, but where one can afford to make special levers of different lengths, the one shown is most satisfactory.

Yours truly,

A. W. Gibbs,

Assistant Mechanical Engineer, Pennsylvania Railroad,
Altoona, Pa.

[The prints reproduced herewith need but little explanation. The lever is shown in detail, also the lignum vitæ sliding blocks. The lever fulcrum and means for adjusting it are much the same as in the illustrations in our June issue. The fulcrum pin is clamped firmly in the fulcrum and between the latter and the lever is a motion-rod guide clamped to the same pin. It provides a support for the square end of the motion-rod, and the square end, which is 10 inches long, is drilled for a pin which also passes through the sliding block in the lever. The support for the motion rod at the steam-chest end consists of an adjustable standard with a steel ball in a babbitted socket, the rod passing through a hole in the ball. The method of attaching the cord is the same as in the other rigging.

This rigging and the one previously illustrated are two excellent examples of serviceable rigs, the one illustrated in June being adjustable to a number of locomotives of different dimensions, while the one here shown is simpler and has fewer parts, but is not adjustable to the same extent as the former one. It would probably require a new lever for each class of engine, all the other parts being retained. But as Mr. Gibbs has pointed out, it is a better rig than the pantograph, and while the cost of several levers may be raised as an objection, it should be remembered that the cost of keeping lost motion out of the pantograph will in a measure offset this expense where much indicating is done. —Editor.]

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