are frequent stops are compelled to make the pumping a kind of secondary duty, shutting injector off and putting it on in making their stops and starts, whenever they get time; and the harder an injector is to handle and the more inaccessible it is, the less it is regulated. The water-glass is nearly always situated so it is not in plain sight of an engineer (something like the air gage), so he guesses where the water is and goes ahead.

A fireman can practice economy by exercising good judgment in putting coal in the firebox, but it takes better judgment to practice economy after the coal is in the firebox.

This trouble is worse on a ten-wheeler, where the engineer sits alongside the boiler.

A. A. LINDLEY,
Iowa Central Railway.

Oskaloosa, Iowa.

New Express Engines for the North-eastern Railway.

Editors:

I notice, on page 764 of your September issue, a statement that the above locomotives, with 91-inch coupled driving wheels, are of the two-cylinder compound type. This is incorrect. They are single-expansion engines with cylinders 20 x 26 inches. Nor have fifteen of the class yet been built, as stated. Only two are at present out and running. Some other engines, also simple, but having drivers 7 feet 1¼ inches in diameter, and cylinders 19 x 26 inches, were built at Gateshead Works at about the same time as the former larger type, which has no doubt led to the errors referred to.

As very possibly some further particulars of the latter will be of interest to your readers, I subjoin the principal dimensions of the engines:

Cylinders—Diameter, 18 inches; stroke, 26 inches.

Wheels—Driving and trailing, 7 feet 7¼ inches; bogie, 3 feet 7¼ inches.

Boiler (steel)—Center line from rail, 8 feet 2 inches; length of barrel, 11 feet 6 inches; outside diameter, 4 feet 4 inches; thickness of plates, 9-16 inch.

Inside firebox (copper)—Length at bottom, 6 feet 3½ inches; breadth at bottom, 3 feet 2¾ inches; depth at front, 6 feet 4½ inches; depth at back, 5 feet 9 inches.

Tubes (brass)—Number, 201; length between tube plates, 11 feet 10⅛ inches; diameter outside, 1¾ inches.

Heating surface (total)—1,300 square feet.

Grate area—21 square feet.

Diameter of exhaust nozzle—4¾ inches.

Weight of engine in working order—On bogie wheels, 16 tons 8 cwts; on driving wheels, 18 tons 14 cwts; on trailing wheels, 15 tons 14 cwts. Total, 50 tons 16 cwts.

The tender weighs, with 5 tons of coal and 4,000 gallons of water, 39 tons 10 cwts; the total weight of engine and tender being, therefore, 90 tons 6 cwts. The latter is also fitted with a pick-up water apparatus, to enable the engines to run 124½ miles (Newcastle to Edinburgh) without a stop.

F. W. BREWER.

London, Eng., Sept. 15.

P. S.—Mr. Wilson Worsdell is the engineer.—F. W. B.

Locomotive Boiler Tool.

Editors:

It is often the case that flues are taken out of boilers, and to do this, a main hole (or somewhat larger hole) is made in front sheet, where the flues are shoved through, and in that way taken out. The

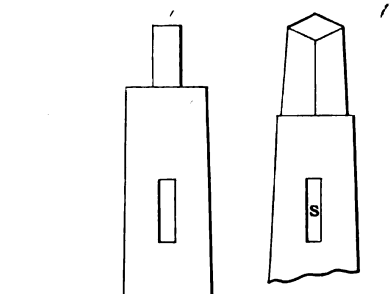

Fig. 4

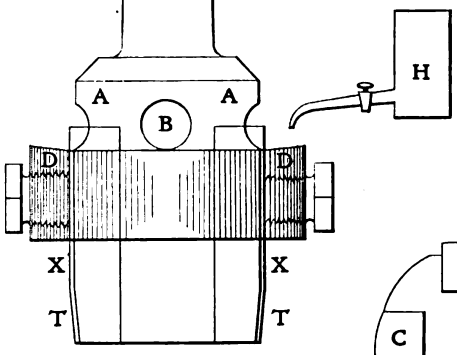

Fig. 1

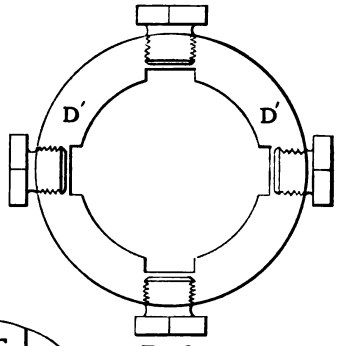

Fig. 3

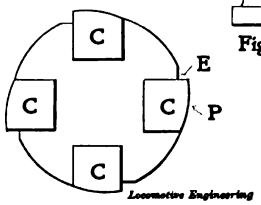

Fig. 2

engraving represents an adjustable boring tool, for enlarging holes, which in a few minutes time can be set to required size.

Fig. 1 consists of body *A A* and shank; collar *D D* or D^1 D^1, Fig. 3; and cutters, *C C C C*, Fig. 2.

Four holes are drilled like *B*, Fig 1, with $\frac{11}{16}$ inch bit drill, and ½ inch deep. Then we plane or mill four grooves where cutters, ⅝ inch square steel, are put in, and collar D^1 D^1 slipped on. Then we turn cutters at *X X*, and taper the end *T T* whatever size we want. We can have three or four sets turned up, whatever size is likely to be needed, and have them on hand.

E, Fig. 2, is clearance for oil and chips, and cutters want to be backed off a little at *P*, and cutters sharpened at *E* only.

If we have no socket ratchet for shank, Fig. 1, we make shank like Fig. 4, and we can use it on drill press just the same; the key *S* will hold it.

H is oil tank. When tool is used on drill press, the oil drops on top of collar *D* and finds its way down where it wants to be. When the master mechanic orders flues taken out of an engine, and the 154 holes in back flue sheet want to be enlarged, the cutters are put in in a few minutes and the tool is ready for use.

J. A. EISENAKER.

Elmira, N. Y.

An Engineer's Experience with the Brown System of Discipline.

Editors:

As the great railroad managers of the United States seem so much interested in the "Brown System" of discipline, and I hear of some enginemen who object to it, I have decided, for the benefit of those who do not understand it, to submit this letter detailing my experience under that system.

I entered the service of the Fall Brook Railroad Company in 1871 as an apprentice; after working nine years in the shops as an apprentice and journeyman I was made a fireman and served the company in that capacity two years and a half; then I was made an engineer, in which capacity I served ten years. On October 23, 1889, I left Corning on my regular run South. At Stokesdale Junction I met and checked off on my time card the last train I was to meet, forgetting the fact that there was another of the same number as one of those I had checked off, which was late from the day previous, and which, if it had been on time, would have reached Corning before I left there. I soon discovered this, however, as we met just north of Paducohi; it was a "head-ender," and, I am told, cost the company about $4,200. Strange to say, the men of both

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crews escaped without injury. It was a fearful sight.

When we finished picking up the wreck I went to Corning, called on General Superintendent Brown and explained my unfortunate error. When I had finished he looked up and said: "Jim, I am awfully, awfully sorry." I replied: "You can't regret it more than I do, as I lose all—my reputation and my wages." He said: "No, not so bad as that," and he was as good as his word. He put me back in the shops, where I worked about a year, then took my place on the road again, and have run steadily since.

I believe that I have helped to prove that it is useless to lay men off for anything; the fact that I know my record contains a full account of that wreck is sufficient punishment and will stand there to warn me against another such mistake, to say nothing of the fact that my company's consideration for me was fully known to the working men about here, and encouraged them in the belief that all they had to do was to tell the truth and honestly perform their duties, and they would never lose a day's time.

Men are not infallible, and the company takes this into consideration; if they show a disposition to do their whole duty, so far as is possible for a human being to do, and profit by any mistakes they make, they are given a chance to do so, but no wilful carelessness is tolerated for a minute. When I went to work for this company very few of the engineers or conductors owned any property. Now it is not anything unusual to meet brakemen and firemen who own their homes, and the majority of the engineers and conductors own their homes, some of them having nice farms, houses that they rent, etc., besides. My father and one of my brothers died in the service of this company; two of my brothers and myself are working for it now and expect to die here.

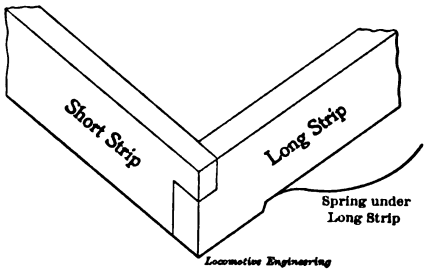
We all feel proud of the fact that so many great railroad men are adopting the "Brown System," and I am sure that it is only a question of time when they will all fall into line. Under the old "Suspension System" of discipline an employé was laid off for all mistakes, and during that enforced idleness generally squandered any little savings he had accumulated while at work, to say nothing of the fact that bad habits were often acquired under such circumstances. The adoption of the "Brown System" by any corporation demonstrates to its employés that good service is all that is required, and that, instead of seeking opportunities to punish men, premiums are offered them when their services are satisfactory. Talk is cheap, but money counts; when premiums are offered men to encourage them to improve their own condition, there is a genuine ring to it that is unmistakable. Corporations that use such methods as these must have the sympathies and voluntary co-operation of their employés; when a man's pocket feels the weight of his employer's arguments each year, he is convinced that it is a good one and not altogether selfish, and this is what the "Brown System," as applied here, does for Fall Brook employés.

One year's application of this system will do more to perfect the discipline of men than all the threats, punishment or persuasion that might be used to accomplish that end. Men engaged in handling trains on a single-track railroad are forced to do their own thinking while doing so, and it is safe to say that no one interested so keenly appreciates all the advantages and disadvantages of a system of discipline under which they work as if for themselves.

Every possible feature of its present and future effect upon them is thought over and discussed among them, and if there are any "holes" in such a system they are sure to find them; but during all the years that the "Brown System" has been in operation here I have never heard an intelligent man raise an objection to it. All reflective men are hoping, for the sake of all concerned, that the barbarous "Suspension System," like stocks, whipping-posts, etc., is to forever hide its ugly head, and reliquish the firm seat it once had in this land of enlightenment to the humane and effective "Brown System."

JAS. N. ROBINSON.

Corning, N. Y.



Improved Balanced Valve Strips.

Editors:

Herewith I send you sketch of standard balance valve strip as used on the Gulf, Colorado & Santa Fé Railway. The long strip supports the short one as shown, thereby dispensing with the short spring, consequently reducing the wear on shields and strips to a minimum. We have engines fitted up in this manner that have run three years without any attention being given to the balanced parts, and are still in good shape.

T. L. STEVENS.

Temple, Tex.

Notes of Early Railroading.

Editors:

"Locomotive Engineering" has published during the current year some very interesting illustrations of old-time engines, and the following bits from my historical scrap heap may be a not unfitting supplement; and although, as an unqualified statement, "Comparisons are odious," there are some which are not only not odious, but are amusing and instructive. I have at hand some such relating to the early days of railroading which the editor may find of sufficient interest to accept.

We are usually led to believe that the first example of steam railway locomotion was that on the Stockton & Darlington Railroad, in England, on the 27th day of September, 1825. There is, however, good reason to consider that antedated by a few years by the Hetton coal railroad, extending from Sunderland on the river Weir to the Hetton collieries, something over 7½ miles; and, for the matter of that, long before, by the steam road at Merthyr Tydvil, in South Wales, in 1802.

The Hetton road was operated by a combination of locomotive and stationary engine; the latter at the highest point of the road, to drag the cars or "wagons" up the grades—called "planes" in those days. Quoting from an account of that time, "a single loco-motive engine, with twenty-four wagons, has drawn six hundred tons a day, going nine gaits—i. e., thirty-five miles forward and return." Two items of information to be gathered from this bit are—that it is not at all new to "get a gait on," and that hyphenated engines did duty before the days of "Chordal."

Mr. Wm. Strickland, C. E., from whose account, written seventy years ago, I have made the foregoing quotation, informs us further: "The loco-motive engines are made of thick sheet iron, and are obviously of the high-pressure kind . . . . are for level lines of road only, for the engine itself in any material ascent consumes a great portion of its power in the movement of its own weight and that of its fuel, and any sudden rise would annihilate its object and use. . . . The rails are of cast iron, and four feet long. . . . The engine is of twelve horse-power, weighs five tons, and cost £600."

An account in 1826 assures us that a locomotive can be made which will be able to move on a level track, "without a rack and pinion, its own weight and eight (!) times as much besides." What a pleasing little comparison there is right here with to-day, using as the object-lesson, say, the Erie "decapod," with its 96 tons weight and hauling capacity of 4,600 tons!

Concerning the Hetton road, further, Mr. E. Hazard wrote at Philadelphia, under date of March 27, 1827: "On the Hetton railway they are abandoning the locomotive. The jar caused by the wheels over the ends of the rails, although apparently trifling, is found to destroy the joints so fast as to make it cheaper to maintain stationary engines at two miles apart, with ropes extending between, to draw the wagons. . . . . When the railway crosses a public road, the rope is bent down by friction rollers, and carried under a plank bridge to the other side of

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