

Science and Art.

Improved Locomotive Link Motion.

The accompanying engravings represent improvements in Link Motions, patented March 20, 1855, by Messrs. Uhry & Lutgens, Paterson, N. J. The link motion is so extensively applied to locomotives and also to marine engines that any mechanic acquainted with its appearance will at once perceive the modification in the design here shown; but we believe that the effects or working of this motion are not so well understood. There was a time when it was almost entirely discarded on account of its defects. Still, it has one advantage over a common lap valve moved by an independent eccentric, in connection with an independent cut-off, viz., that the exhaust does not commence within 1-4 of an inch from the end of the stroke, as it does in case of the latter, but graduates with the degree of expansion, and therefore barely allows the steam to expand thrice its original bulk, even at the highest cut-off, thereby causing great loss of steam; though it is allowed that an engine, with it applied, will run faster and easier than with most other contrivances. Its defects are, too small a steam port, a too early exhaust, as already referred to, and early compression.

The method commonly employed with link motions to retard the time of exhaust, is to increase the inside lap, which, though it may be advantageous in a small degree in that respect, still increases the compression and chokes up the exhaust port.

If these defects may be radically remedied and that peculiarity of the link motion which contributes to its present efficacy be brought under the immediate control of the engineer, its introduction and use will be a matter worth the attention of engineers. These results are believed to be fully accomplished by the inventors of the present improvements. They have lately made a series of practical experiments, in which the superiority of their invention was abundantly demonstrated. We are obliged to omit the tables referring to the same.

On these trials the improved link motion operating upon a single valve had 3-32 inside lap, and presented some decided advantages over the common links, among which are the following: The lead only uses about 1-2 to 1-3 of the time of the stroke to open before the commencement of the next, than on the common link, where it increases to the amount of two and three inches of the stroke of the piston at the higher notches; further, the steam port is more than doubled and the time of exhaust is retarded at the higher grades of expansion, while the exhaust port opens nearly three times as quick at these points as with the common link, while the amount of inside lap given to the valve has barely any effect upon the compression, as it nearly commences with the point of the exhaust.

The inventors are of the opinion that compression, in a measure, and where rightly applied, may be an advantage—just as a spring is to a trip-hammer—and it will never of itself cause any loss of steam; but it is necessary that that force which it is calculated to neutralize should yet have an existence, viz., part of the momentum of the reciprocating parts. But this is by no means the case on the common link motion, as the exhaust coming in too early, thus preventing the steam to act while yet efficient; the momentum of the reciprocating parts has expanded itself before it meets the compression, the latter thus directly opposing the motion of the engine, and thus, as it has been shown by experiments, say the inventors, causes a loss of from 20 to 25 per cent. of the power at the highest notches.

In the engravings the same letters refer to like parts on all the figures. D represents a common shifting link, supported by connecting link, G, which latter is attached to the reversing lever, H and J, being operated by the reversing rod, O; the link, as usual, is operated by two eccentrics, B and C,—C acting in the forward, and B in the back motion. The link is provided with a die, which, in figs. 1 and 2, operates the rocker, F, while in fig. 3 it actu-

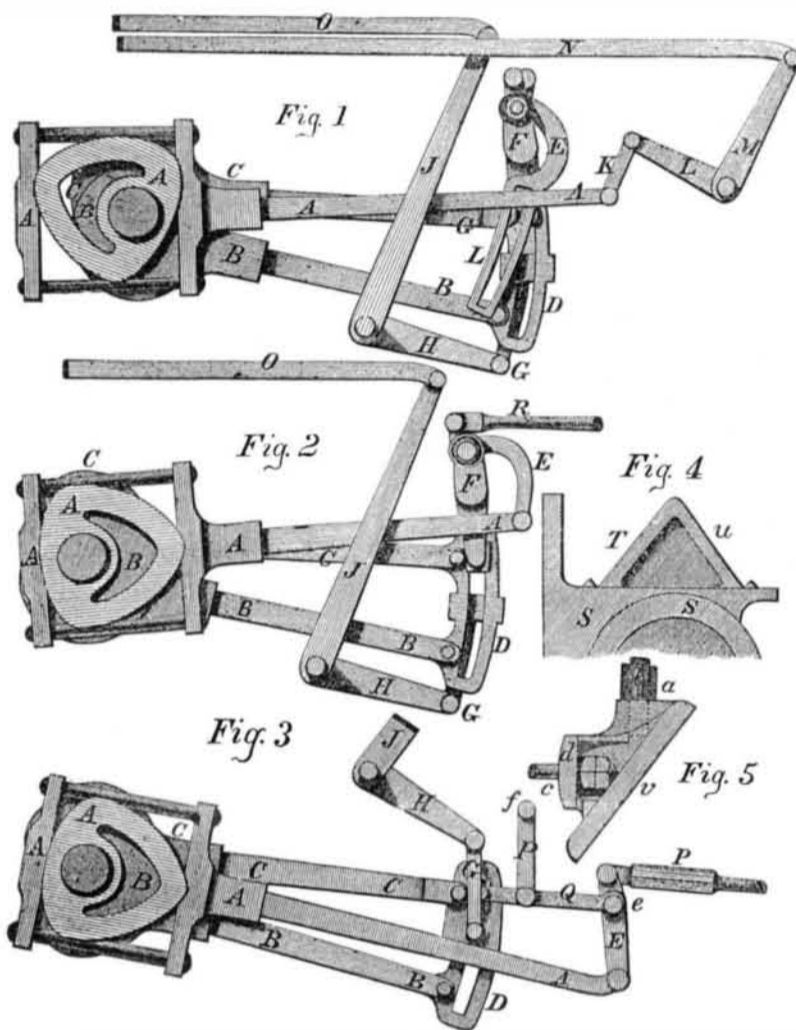
ates connecting rod, Q, suspended by the link, P, at *f*, to some part of the framing of the engine. Besides the rocker, F, there is a differential rocker, E, operated by an eccentric or cam, A, and partakes also at its fulcrum of the motion communicated by the link, at a point shown in fig. 3 by letter *e*. The upper end of this rocker operates, in fig. 1, the exhaust valves, while in figs. 2 and 3 it communicates, by valve rod, P, motion to a single valve. In fig. 1 the lower extremity of this rocker is provided with a slotted segment, bearing a block attached to rod, A, being connected by link, K, to the reversing lever, L M, which is held and operated by the reversing

rod, N. In fig. 3 the valve rod, P, moves in a guide attached to the framing of the engine.

Fig. 4 represents the arrangement of the valve seats, T and U; S representing the steam cylinder.

Fig. 5 represents a plate, *v*, resting upon the exhaust valve, and which may be used to balance the latter; the bolt, *c*, holds this plate to the side of the steam chest, the face, *d*, being slightly curved, to permit oscillation, while the hollow bolt, *a*, and the central bolt, *b*, adjust it in its position. There are two bolts, *c*, and two or more bolts, *a*, *b*, near the end of the plate. The bolt is provided with a thread on the outside fitting in the steam chest cover,

IMPROVED LINK MOTION FOR LOCOMOTIVES.



the bolt, *b*, having a shoulder resting on the top of bolt *a*, while its nut is secured in *v*.

The figs. 4 and 5 form part of the motion of fig. 1, and the balancing of the larger valve is accomplished in a simple manner, as no provision need be made for the escape of compressed steam, as the small plate upon the valve seat, *n*, and which is moved by the ordinary link motion, will open the communication.

The position of the cam in relation to the eccentrics in the several figures is as follows: If the eccentrics in all the figures be brought in a vertical position, so that a perpendicular tangent will touch the peripheries of both eccentrics, then a horizontal center line drawn through the center of the axle will form in fig. 1 an angle of twenty-five to thirty-five degrees with the center-line of the cam to the relative position of the eccentrics, as shown in the engravings; in figs. 2 and 3 from five to ten degrees with the center-line of the cam, above or below the horizontal center-line, depending upon the direction in which the point of connection is located however the position of the cam may be varied, and different results thus obtained, as various modifications may also be produced by the amount of throw, and the point where the shaft passes through the cam. The proportion of throw and lap adopted in the experiments were for the eccentric, 5-inch throw, cam 6-inch. throw, the valves having from 1 1-8 to 1 1-4-inch outside lap.

A modification of these improvements is a small cam or eccentric placed and adjusted at *e*, fig. 3, the yoke or strap surrounding it forming part of the valve rod, P, while the cam or eccentric is attached to lever, E, and the extremity of the rod, A, instead of being

connected to a cam or eccentric on the axle is secured by a pin to the framing of the engine.

The cam described in the foregoing description can be easily applied to all engines. It may either be cast together with the back eccentric, or if applied to any old engine, cast in two separate pieces and bolted to the former. The wear of the cam is inconsiderable, because it operates the valve through the intervention of the leverage of the differential rocker, the main power being derived from the link.

The inventors of these improvements are practical engineers, and fully understand what is wanted upon locomotives to insure safety, economy, and speed. More information may be obtained by letter addressed to them at Paterson, N. J.

Cobalt and Nickel.

M. Deville, in a paper before the French Academy, suggests "that other more common metals than aluminum are perhaps less known than may be thought, and he expressed the hope that when he shall have completed a memoir on the pure metals, produced and melted by certain, yet secret, processes, which he has long been preparing, he shall exhibit some unexpected results. Thus he instanced cobalt and nickel, which possess useful physical properties, such as malleability, ductility, &c., developed to a most extraordinary degree; further, they enjoy a tenacity far exceeding that of iron, which hitherto has passed as the most tenacious metal; for, according to the experiments made by M. Wertheim on these metals, the weights which determine the rupture of wires of iron, cobalt, and nickel of the same dimensions are 60 for iron, 115 for cobalt, and

90 for nickel, which shows the tenacity of cobalt double that of iron; besides, nickel and cobalt are worked at the forge with the same facility as iron, are oxydized less easily than iron, and are susceptible of being employed in the same manner as iron."—[Annual of Scientific Discovery, 1856.]

The North river was open to Albany on the 10th inst.—last week. The *South America* was the first steamboat that made the trip up. The river has been closed for nearly four months.

Literary Notices.

CHEMISTRY: THEORETICAL, PRACTICAL, AND ANALYTICAL.—This is the title of a new work on Chemistry, as applied to the arts and manufactures, by Dr. S. Muspratt, F. R. S., and re-published by Russell & Bro., 12 Tremont St., Boston, in numbers (25 cents each.) From the specimen before us it gives evidence of being a complete encyclopedia of chemistry. The engravings are excellent, so is the letter press, and any work edited by Dr. Muspratt cannot fail to be profound and thorough.

HUNT'S MERCHANTS' MAGAZINE for this month contains an able article on the "Improved Condition of Labor," by George M. Weston, in which it is clearly demonstrated that with improvements in machinery and the arts, the value of labor has also increased.—It presents a strong argument in favor of the humanizing influence of useful inventions.

THE BIBLIOTHECA SACRA for this month opens with a profound essay on "The Moral Faculty," by Professor Joseph Haven, of Amherst College. An essay on "The Influence and Method of English Studies," by Professor Shedd, of Andover, should be read by every young man who desires to possess a sound and vigorous style of speaking and writing the English language. Published by Warren F. Draper, Andover, Mass.

FARM JOURNAL AND PROGRESSIVE FARMER.—We regard this monthly, published at Philadelphia, as one of the very best agricultural journals in our country, and recommend it to those of our subscribers who wish to be fully posted-up in all that relates to progressive agriculture. Its articles are not a mere re-hash of things which have been published a thousand times before, but are the contributions of some of the ablest agriculturalists, investigators, and scientific men in our country. Among the contributors to recent numbers we notice the names of Dr. A. A. Hayes, Dr. Sam L. Dana, author of the Mechanical Manual, Lieut. Maury, David A. Wells, and others. Its terms are only \$1 per annum.

BLACKWOOD'S MAGAZINE.—The number for this month of "old ebony" is capital. The first article in it is a review of Roman History. An article on "Biography gone Mad" is both humorous and satirical, and especially so to American readers. "Nicaragua and the Filibusters" forms the subject of another article, in which Walker and his men meet with a favorable notice, and the advantages of the introduction of American influence in Nicaragua are pointed out. This is rather strange for a British Tory magazine. Re-published by L. Scott & Co., 54 Gold St., this city.

NORTH BRITISH REVIEW.—This sterling periodical for this quarter contains nine able essays. One on Color Blindness is deeply interesting to men of science and the public generally. This number is one of the best ever published. As the high literary organ of the Free Presbyterian Church of Scotland it has earned for itself a world-wide celebrity. It is published by Leonard Scott & Co., 54 Gold St., this city.

DINSMORE'S AMERICAN RAILWAY GUIDE.—Published by Dinsmore & Co., No. 9 Spruce St., for this month is an indispensable guide to all who wish to travel by the rail



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