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THE SAXBY AND FARMER SAFETY SWITCHES AND SIGNALS.

We have heretofore had occasion to notice, in the SCIENTIFIC AMERICAN, the merits of the Saxby and Farmer interlocking system, as applied to railway points and signals, which, for nearly ten years past, has been in operation upon the principal English railroads. It has proved successful to such a degree that, by act of Parliament, its use has been rendered obligatory on all new lines in England.

The remarkable capabilitiesof the invention, in controlling the most intricate sets of switches, is practically exemplified at the Waterloo junction station, London. We have before us a photograph of the operating works at this station, at which no less than 108 switch and signal levers, all connected with the many tracks at this junction, are contiguously employed.

It is gratifying to know that this valuable improvement, which is certainly one of the most important of all safeguards against switch accidents, is now being extensively introduced in this country. The Pennsylvania Railway Company, animated by the highly creditable desire to provide their road with the best safety appliances, have lately put up, at the East Newark juncton, on the suggestion of Mr. G. O. Howell, principal assistant engineer of the New Jersey Division, a splendid example of the Saxby and Farmer system The engravings herewith presented are taken from these works. We understand that plans, for the employment of the sys tem at the grand depot of the same company at Jersey City, are now in progress. We hear that the invention will also be employed at the railway junctions on the Centennial Exhibition grounds, Philadelphia, Pa., next year.

Unless an engine driver deliberately shuts his eyes to prominent danger signals and intentionally dashes his train to destruction, it would seem that with the Saxby and Farmer mechanism an accident is hardly possible. The switch tender is utterly precluded from making a blunder either in signals or in locking or setting his points. The very worst he can do is to neglect his duty altogether, and the only result arising therefrom would be a temporary stoppage of the trains. He cannot shift points during the passage of a train and so send the rear cars off the track, nor can he easily signal a line clear until such is the case. The characteristic feature of the Saxby and Farmer system is its absolute positiveness.

Our artist contributes in Fig. 2 a sketch of the locality at East Newark, N. J., showing the converging tracks eading from different portions of New ark to the junction, and on the left the Saxby and Farmer signal cabin, within which all the levers which control the signals and switches are located. Beside the tracks are the home and distant signal posts, the arms of which are always extended, indicating danger, except when lowered by the operator for a few seconds, to signify that the passage is clear. The distant signals are cautionary, and placed 2,100 feet from the switches, and the engine driver, if the signal arm denotes danger, slows down at once and runs to the home post near the switches, and there stops and awaits the giving of another signal before proceeding.

The large illustration, Fig. 1, represents the interior of the signal cabin, the upper story of which is surrounded by windows, affording a clear view in all directions. Here is located the row of levers and the governing mechanism, while beneath the flooring are the counterweights, together with the heavy rods and wire cords which lead to the various points which are to be controlled. The rods and cords extend from the cabin underground, in tubes, to the signals that are to be operated, the most distant of which is nearly half a mile away from the cabin. A sectional view of the lever mechanism is shown in Fig. 3. Just in the rear of the bank of levers is a frame containing two sets of rods, which fit in slots in the extremities of the frame, and have a free longitudinal motion. Connected with each lever arm is a locking bar, which, beside serving as a latch to hold the lever either upright or inclined, also tilts a link which in turn oscillates a slotted piece of metal attached to the lever, and arranged at right angles to the sliding bars, and between them. As the slotted piece is turned, certain dogs or projections on the sliding bars engage in the slots, so that by this means certain levers other than the one or ones moved are rendered entirely immovable, through the bars being thus firmly held. It will be seen at once that, if these hooked projections on the bars be made adjustable, they may be so set and fastened that several of the levers may be locked by the motion of one, and, conversely, that it may be necessary to change the position of several levers before one can be operated. Now in this latter case, if it be supposed that the levers which must be operated first serve to lock facing points, or to cut off connection to a line to be kept clear, then it will be seen that, until this is done, the last lever which sets the signal right cannot be moved. And this is the governing principle of the entire system.

The levers, in order to be readily distinguished, are numbered, and painted in different colors. A black lever moves the switch points, and this it does by the positive connection of bell cranks and rods, leading to a bar between the points. A blue lever governs the locking mechanism which holds the latter in place. The same mode of communication leads to a long pivoted plate lying beside one rail, which, when the lever is changed,

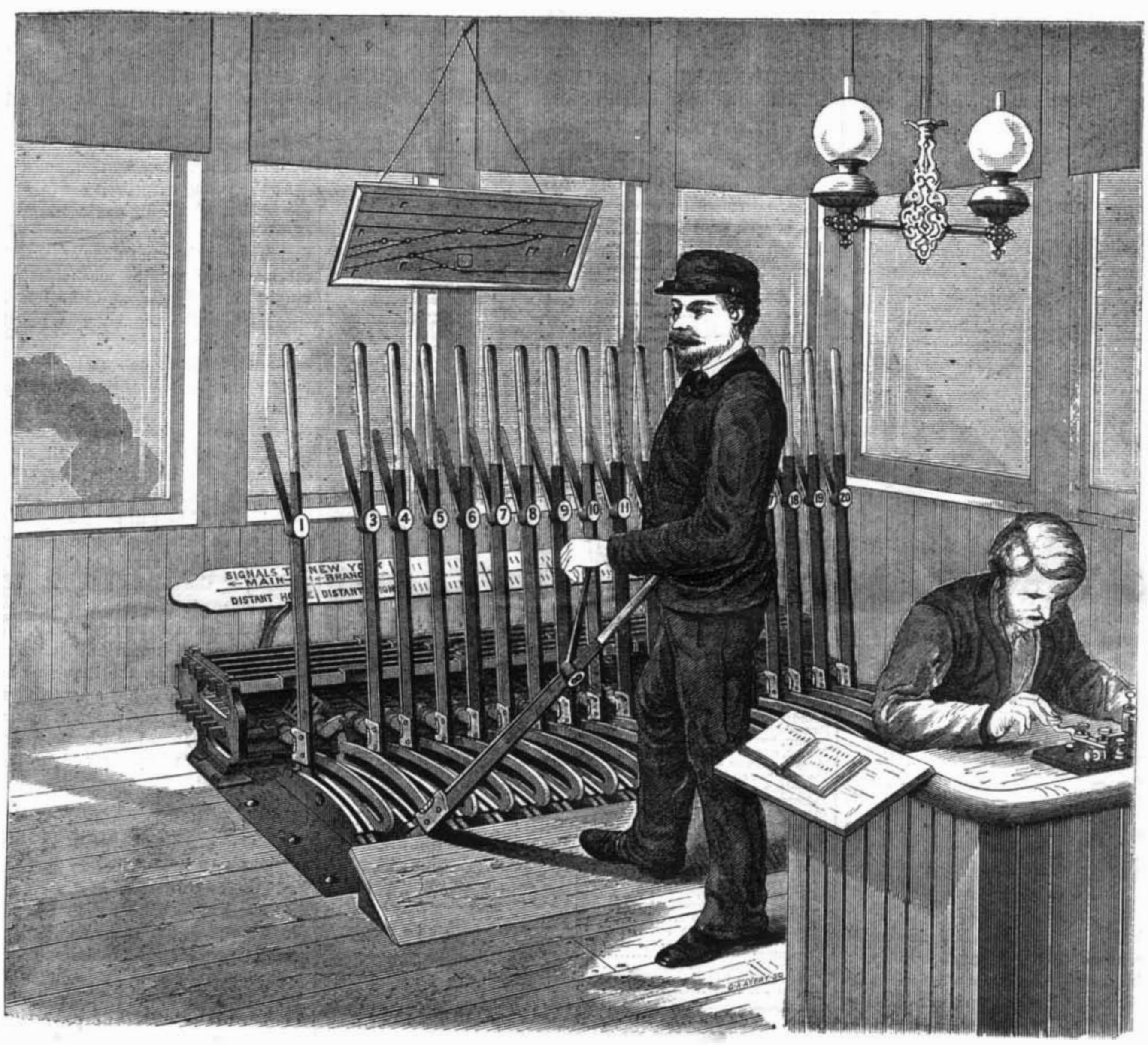


Fig. 1.—SAXBY AND FARMER'S SYSTEM OF RAILWAY SWITCHES AND SIGNALS.

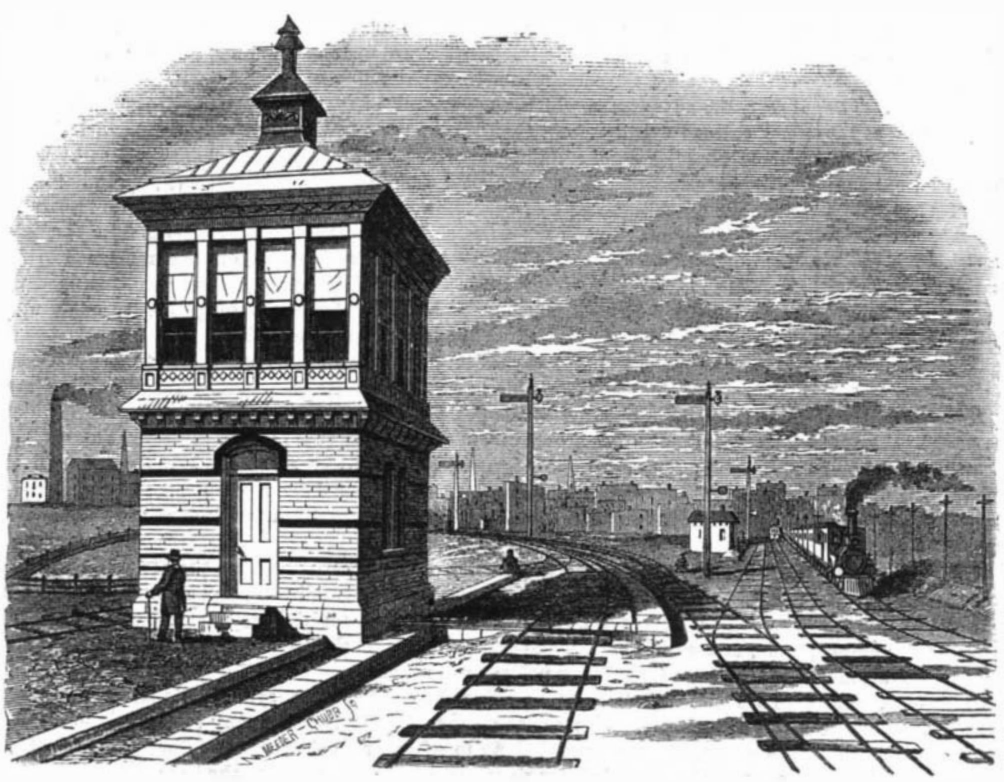
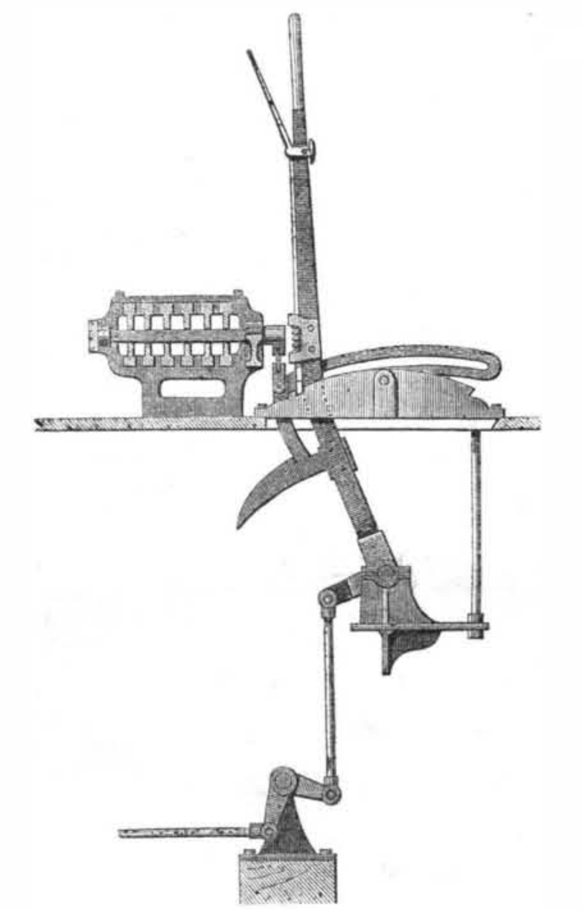


Fig 2.—SIGNAL HOUSE, SWITCHES, AND SIGNALS.

rises up like one side of a parallel ruler, a little above and to one side of the rail, and swings over to a new position. The plate connects with a three-way crank, and the latter with bolts which shoot into the cross piece between the points. It is obviously impossible for the plate to swing over during the passage of a train, for the wheels prevent. Red and green levers manage the home and distant signals, and by suitable wire cords either turn the lights or lower the arms, arms being exhibited by day and lights at night. In rear also of the levers is a plate, showing their uses; and numbers on each serve to individualize them in accordance with a plan of the switches, etc. On each signal lever, besides its number, are marked the numbers of the other levers which must be moved before it can be, so that the operator is provided with every means for showing him instantly what he has to do. It is impossible for him to move No. 2 signal, for example, until he has moved point lever 7 and locked it by lever 8; and then after he has pulled No. 2, that very operation prevents his stirring Nos. 11 and 15, which govern points crossing to the line shown clear by the signal; nor can he move No. 14, which might enable him to give a safety signal to lines which the open road crosses. A point lever cannot be stirred when a signal which should be at danger stands at safety. In brief, the device resembles a kind of permutation lock, each portion of which is both latch and key; sometimes the projections on the bars which serve as the tumblers cause said bars to be shoved to one side, throwing other bars into or out of engagement—and thus all parts are inter-related in an ingenious manner.



The levers are all worked by one man, and he is instructed by the telegraph, the operator and instruments being located in the same apartment with him. The instant the wires deliver the message the levers are quickly moved, and in a few seconds the smoke of the approaching locomotive is seen far down the line. Should any part of the mechanism break, even at the last minute, there is no peril incurred. If any portion of the locking or switch gear give way or get out of adjustment, the signal lever cannot be stirred, and the semaphore arm remains at danger—its normal condition; so, also, if the signal mechanism itself rupture, the result will be negative, for the arm, being counterweighted, will not fall of itself, and, from the break, cannot be pulled down. The levers are moved in an instant; twenty seconds suffices at the Cannon street station in London to move ten pairs of points and all the signals belonging to them. We need not suggest the number of hands and the length of time which would be required to do the same under the old systems, nor the economy in expense and freedom from risk involved in the substitution of the new method.

Mr. Joseph Dixon, Secretary of the Broadway Underground Railway Company, is the agent for Messrs. Saxby & Farmer in this country, and from him, at the office of the above named corporation, 263 Broadway in this city, further and more minute particulars may be obtained. The mechanism in the locality above described was manufactured in the factory of the inventors, an immense establishment in London, N. W., employing some 1,800 men, and imported hither. Certainly, the invention is one of surpassing importance and value; and with that conviction we can confidently direct to it the attention of the railway companies, as well as that of the public in general.

A kind of tracing paper, which is transparent only temporarily, is made by dissolving castor oil in absolute alcohol and applying the liquid to the paper with a sponge. The alcohol speedily evaporates, leaving the paper dry. After the tracing is made, the paper is immersed in absolute alcohol which removes the oil, restoring the sheet to its original opacity.

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NEW YORK, SATURDAY, APRIL 3, 1875.

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(Illustrated articles are marked with an asterisk.)

SCIENCE IN COMMON SCHOOLING.

If it were possible to dispossess an average school boy of all the mental development and discipline, with all the knowledge, general and special, which he did not get in school, there would, we fear, be precious little left for the schoolmaster to take pride in. Still more, were it possible to set off, against the certain benefits of schooling of the usual sort, the advantages which a better ordered system of primary culture would afford, the popular appreciation of the schools would, we are certain, be seriously disturbed.

There are few places that can boast a more liberal scheme of public schooling—liberal, that is, in time and material—than this city of New York. Her children may begin with the alphabet and end with a college diploma without other aid than that which the free schools afford. Yet the records of the schools show that, of the hundreds of thousands of children who have begun their schooling in them, more than half have gone out unable to read intelligently an easy page of print. Of those that are able to stay longer—that is, more than three or four years—it is but the fortunate few who are able, when their school days come to an end, to read with understanding the foreign telegrams in the morning paper; probably to not one in a hundred is the daily report of prices current any more intelligible than a page of integral calculus.

The fault lies less with the brevity of their school life than with the misuse of it which the school system entails—a system which makes a fetich of alphabet and multiplication table, and wastes on these tools of culture the children's best opportunities for gaining power to use them.

To insist that Science teaching be grafted on a system whose practical results are so meager is only to make matters worse. The sciences belong to a higher level of education, and should be left for riper years. At this stage of the child's development, the Sciences, as systematized groupings of related facts and principles, have no existence, only objects and sensations, palpable facts and tangible relations, have being in the child world; and the child is merely the observing traveler and explorer. The scientific geographer, geologist, and the rest come later. Could we control the work of the common school, therefore, we should rigorously exclude all Science teaching, real or pretended, and all teaching not scientific.

Schoolmasters who imagine that teaching scientifically means cramming children with facts, principles, and theories in geography, grammar, physiology, physics, and what not may accuse us of making a distinction where there is no difference; but the difference is as wide as between right and wrong. The most unscientific teaching which the common schools—and not a few of our higher schools, also—are guilty of appears in their teaching of the sciences. We would have none of it. Nevertheless, we say, as we have said before, that to educate truly, the work of the primary school, in matter and spirit and method, should be, from first to last, purely scientific. In other words, the work of the primary schools should be shaped to accomplish these three ends:

(1) The systematic development and training in quickness, keenness, and accuracy of all the child's faculties of sense, through the pleasurable exercise of the senses; for in primary culture joy is the great quickener and inspirer of effort.

(2) The systematic development of the child's mental faculties by varied acts of discrimination, judgment, and memory, dealing primarily, if not exclusively, with sensations.

(3) The formation of right habits in knowledge-getting, and in applying knowledge, through the personal observation, handling, investigation, and using of common things.

As the young surgeon is set to study the human body; as the student of mining engineering is made sensibly acquainted with the ores he expects to deal with, their mineral associates, and the conditions of their existence; as the practical machinist studies mechanics, so the child should be taught to study the world he has come to live in; not as a specialist in Science, but as a practical man, determined to master his environment. In this way only can his powers of sense and intellect be rightly developed and trained, and he be fitted to play well his part in the great game of life.

To this end letters are useful as auxiliaries, and for the cultivation of the wide fields of thought that lie without the pale of Science; but they should not be made the beginning nor the end of instruction. If one part in ten of a child's school life be devoted to letters, and the rest employed as we have indicated, he will not make less progress in reading than if the whole time be given to them; and he will be immensely better fitted to turn the art to advantage in after years. Besides, if the child's schooling be untimely cut short, as now happens in the majority of cases, his scientific training would fit him to make something, nay, to make the most, of his out-of-school opportunities. Far better absolute ignorance of letters, with the inquiring habits of mind and educated senses to be got by scientific training for a year or two, than the half-acquired art of reading, which the majority of children carry from the schools, weighted with the unawakened faculties and apathy of knowledge which they too commonly exhibit.

SYRIAN SPONGES.

The latest project before the Acclimatization Society of Paris is the cultivation of the celebrated Syrian sponge in the waters of Southern France, a valuable and most useful product, which, like many another gift of the sea, is in danger of extermination through excessive fishing.

The sponge-producing grounds of Syria occur along the coast, from Mount Carmel in the south to Alexandretta in the north, the centers of production being Tripoli, Ruad, Lattakia, and Bartroun, on the coast of Mount Lebanon. The best qualities are found in the neighborhood of Tripoli and Bartroun. According to a late report of the British vice consul at Beyrout, as many as three hundred boats are engaged in the fishery; the annual yield, though falling off through the exhaustion of the grounds, still amounts to $100,000 to $125,000. The majority of the boats used are ordinary fishing boats, from eighteen to thirty feet in length, three parts decked over, and carrying one mast with an ordinary lug sail. They are manned by a crew of four or five men, one to haul and the rest to serve as divers.

In former years the coast was much frequented by Greek divers from the islands of the Archipelago; the number is now restricted to five or six boats a year, the skill of the Syrian combined with his better knowledge of the fishing grounds, enabling him to compete successfully with his foreign rival.

Diving is practised from a very early age up to forty years after which few are able to continue the pursuit profitably The depth to which the diver descends varies from five to thirty "brasses," or from twenty-five to one hundred and seventy-five feet. The time he is able to spend under water depends on natural capacity, age, and training; sixty seconds time is reckoned good work—in rare instances eighty seconds are spent under water. The Syrian diver uses a heavy stone to carry him quickly to the bottom, and is drawn up by a comrade. On the bottom, he holds the guide rope with one hand and tears off the sponges with the other, placing them in a net which he carries. No knife, spear, or instrument of any kind is used in detaching the sponges; nor does he, like his Greek competitor, ever use the diving dress, having an antipathy to it on the score of its reputed tendency to produce paralysis of the limbs. Two or three fatal accidents occur annually, mainly among the skillful and daring, who sometimes drop the rope to secure a tempting prize, and