SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLV.—No. 16. [NEW SERIES.] NEW YORK, OCTOBER 15, 1881. [$3.20 per Annum. [POSTAGE PREPAID.]

THE RAUB CENTRAL POWER LOCOMOTIVE.

We present illustrations of a new system of constructing railroad locomotives, recently patented by the inventor, Doctor Christian Raub, of New York city. The object of this invention is to construct a perfectly balanced locomotive, in which the center of gravity is coincident with the vertical median line of the engine, and in which the motive power is located at the middle of the engine in a plane extending through the center of gravity. These two objects being attained, it is hardly possible to overestimate the value of the invention, since the locomotive will then be constructed upon correct principles and according to natural laws. It works from its center, and has its motive power situated in a plane extending through its center of gravity, and has therefore no dead weight.

It is not within the scope of this article to review the various attempts and experiments undertaken in the course of time in this direction, but it may be stated generally that the problem of locating the center of gravity in a railroad locomotive upon the center of its base formed by the driving wheels, and to place the motive power at that center, had not been solved before the invention of Dr. Raub; and probably the reason why these attempts have not been successful is, that the fact was not sufficiently realized that Stephenson's system was at variance with the principles above referred to, and that nothing short of a radical change of

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Fig. 2

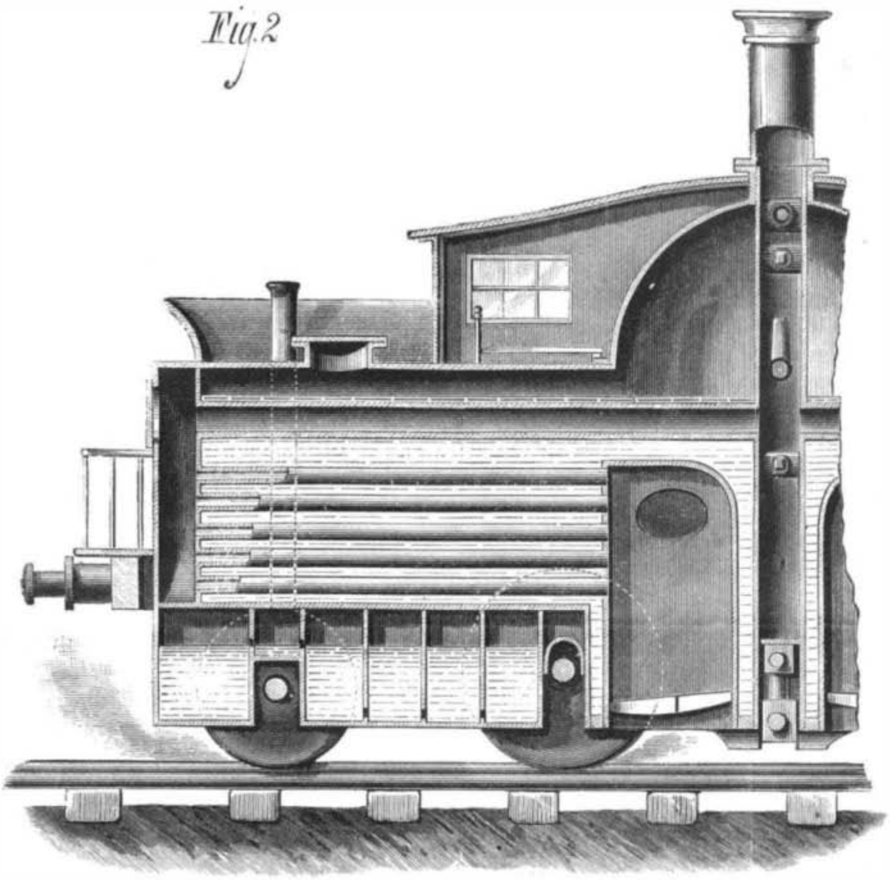
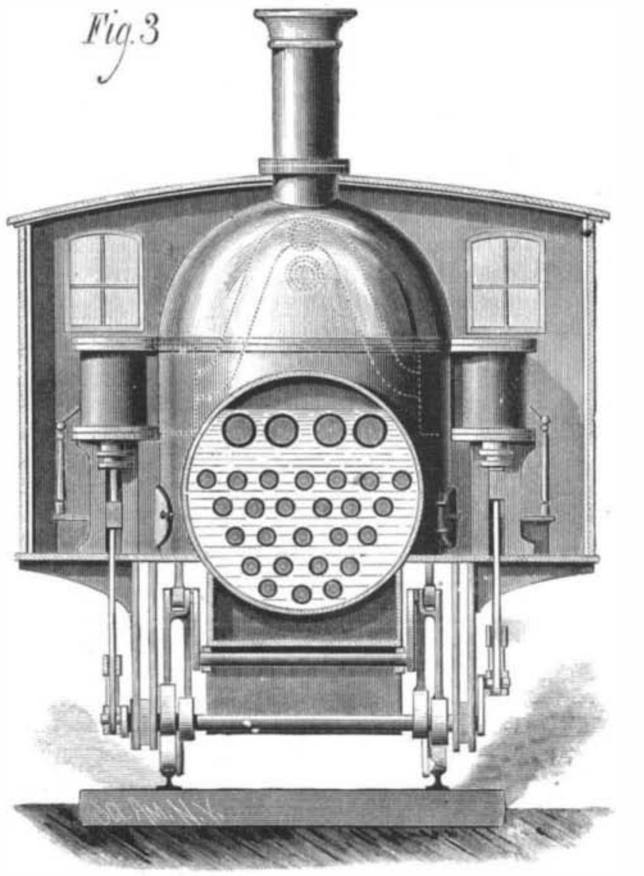
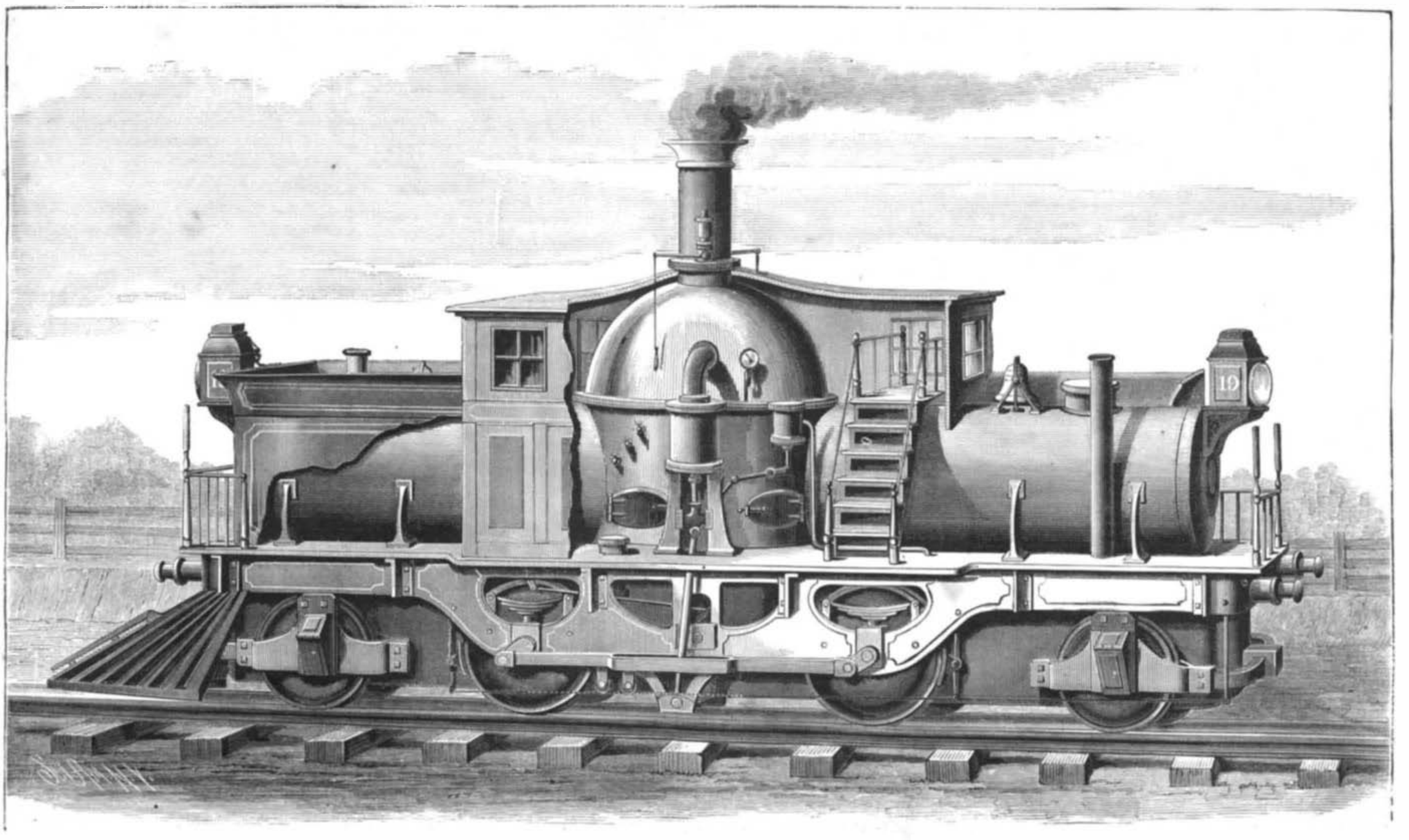


Fig. 3





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the whole system of construction could lead to success; any improvement upon the original design, no matter how great, could not overcome the faults or disadvantages which were inherent in the system as a whole.

Dr. Raub, in order to definitely locate the center of gravity, has constructed his engine in such a manner that each half of the total structure, whether divided longitudinally or laterally, is an exact counterpart or duplicate of the other half, both as regards weight or measure; the consequence of this is that the center of gravity is in the intersection of the longitudinal and transverse center planes of the entire locomotive; and by placing his motive power in the central transverse vertical plane of the engine he has disposed the parts of his locomotive to the best advantage for economy and efficiency.

The engravings represent the invention so clearly as to require but little explanation. The whole engine rests upon an oblong platform which extends all around the structure, and which is made wider in the middle to support the engineer's cab, which will be as wide as the cabs now in use; at each side of the engine is a boiler extending longitudinally to the end of the locomotive, each boiler having a separate firebox, which is located in the cab. The boilers have ordinary flues, which terminate in a smoke chamber at the extreme ends of the locomotive, but instead of allowing the heat and gases to escape through smokestacks at the ends, as in the present locomotives, they are conducted through return flues of a larger size (as shown in Fig. 3) to an interior collecting smoke chamber, which thus collects the smoke and gases from both boilers, and allows them to escape through one common smokestack which stands above it. This collecting smoke chamber extends upward and downward vertically through the entire locomotive, and serves not only as a brace to the steam dome which surrounds its upper portion, but also gives an additional support and strength to the entire structure. The steam dome stands in the center of the locomotive, its axis being the exact center of the engine. It is stiffened by the collecting smoke-chamber which extends through it. A separate valved connection is made through this interior smoke-chamber for the steam as well as for the water in the boilers, so that both steam and water can circulate freely from one boiler to the other, or may be shut off if it is desired to use one boiler only. The steam cylinders are vertical, and placed outside the steam dome, their axes being in the vertical transverse plane extending through the center of gravity of the locomotive, and preferably placed as high as possible, so as to take the steam by means of pipes which receive their steam supply from a common opening at the highest point in the steam dome, the opening being closed by a throttle-valve operated in the usual manner. The steam chests are placed inside the dome as shown in Fig. 3.

The driving-wheels are situated equidistant from the center line, and upon them rests the whole platform, and in the center-line, and as near the rails as possible, is placed an intermediate driving shaft, to the cranks of which, on opposite sides of the locomotive, extend the connecting rods from the cross-heads of the piston rods above. The cranks of the two drivers on each side of this vertical connecting rod are connected in the usual manner by a horizontal driving rod, which, near its center, extends downward to the crank of the intermediate driving shaft and is connected with it. The driving rod is slotted in its center to allow the vertical connecting rod free play.

The eccentrics are placed upon the intermediate driving shaft, while the link motions are arranged on an auxiliary shaft vertically above it.

The locomotive may have horizontal cylinders, if they should be preferred. In that case they would be placed lower down in a line with the center of the driving wheels, but in the same central position.

At each end of the locomotive the frame rests upon a truck, but as the whole engine is evenly balanced upon and supported by the driving wheels, the object of the trucks is not so much to support any specific weight, as in other locomotives, as to serve as a guide over curves. Each end truck has one transverse axle with one pair of wheels and a frame which incloses the wheels and is connected by an arc-shaped guide piece, which is transversely guided in a fixed center box at the end of the locomotive.

The water tanks are below the boilers, openings being provided to allow the axles of the wheels to pass through. The fuel is carried in bunks arranged sideways and above the boilers.

A novel and ingenious plan is devised for feeding the boilers. The return flues being situated but a few inches below the water level, it is important that the level should be continually kept up. The inventor has, therefore, arranged a steam pump, which is worked by a lever connection with the main piston, and which injects into the boilers at each stroke of the piston the equivalent of water for the steam used.

These are the main features of this novel engine, which the inventor claims as the first locomotive built upon strictly scientific principles.

The advantages claimed for this new style of locomotive, and to which Dr. Raub has given the appropriate name of central power locomotives, are numerous.

This engine has no dead weight, therefore its whole power can be utilized for drawing freight; and it is claimed that a central power locomotive of any given size will do more work than another locomotive of the same size under the same conditions. The heat is better utilized, as it is led back through the boiler by means of the return flues, and the fuel will be more fully consumed than it is now. The collecting smoke chamber, which extends upward through the steam dome, serves to superheat the steam, consequently dry steam will be obtained, and the steam chests being inside the dome, no loss of steam from condensation will take place. Should an accident happen to one of the boilers, the connection between the two may be interrupted, and the remaining boiler will be sufficient to propel the train to the next station, thus preventing blocks on the road and delays to traffic.

It is claimed that a train may be run at a much higher rate of speed with this engine and with much more safety than now, owing to the balanced driving wheels and the peculiar relation of the parts; and there is less danger of breaking the driving rods and less strain upon the track.

A separate tender will not be required, as both water and fuel are carried upon the locomotive itself; and, furthermore, turn-tables with their necessary attendance will become superfluous, since the locomotive is a perfect double-ender, and runs in either direction with equal efficacy and without any damaging effect to the gearing.

We understand that Dr. Raub is now making arrangements to build several locomotives according to his new system of different patterns and sizes, in order to practically test their merits and superiority and to ascertain the actual percentage of saving in running them.

The doctor has for many years been identified with several large Western roads, and is well known as a prominent and able railroad engineer.

New Railway Ventilating Apparatus.

The system of ventilating cars devised by Mr. Andrew J. Chase, of Boston, was put to a test on a car on the Boston and Albany road, Sept. 12, which is thus described by the Boston *Herald*:

"The 11 o'clock express train for New York was taken. Accompanying Mr. Chase was Mr. William B. Lindsay, assistant in the chemical department of the Massachusetts Institute of Technology, and Mr. Adams, the master car-builder of the Boston and Albany Railroad.

"Mr. Lindsay went for the purpose of measuring the velocity and volume of the air coming into the car by the supply pipes, and the velocity and volume of the vitiated air expelled, while the train was in rapid motion. The following is a brief description of the apparatus used in this system. There are two general principles involved in it: One, the supply of fresh air, freed from dust, cinders, etc.; the other, the expulsion of the foul air generated by the lungs and bodies of the occupants of the car. The air, as the train passes rapidly onward, is caught by a kind of scoop, or mouth, and is forced, cinders and all, downward through a pipe into a reservoir, where it strikes the water contained therein with sufficient force to be driven through it. After being thus cleansed and cooled the air is forced, by the pressure of the descending column, upward through another pipe or funnel, and discharged into the body of the car. This air, being pure and cool, naturally gravitates to the bottom of the car, displacing the warmer vitiated air, which then ascends to the top of the car, where it is got rid of by an ingenious device. This consists of two long pipes or tunnels laid upon the outside of the car, on each side of the monitor top. These tunnels are jacketed at both ends by a larger pipe, having a kind of bell mouth, to better gather in the air. Through these outer bell-mouth tubes—that is, the rear ones—the external air rushes with a velocity proportioned to the momentum of the car.

"This air, by its rapid movement, serves to siphon or pump the vitiated air out of the car, the tunnel used being connected with the interior of the car by small siphon pipes through which foul air is thus withdrawn. There are valves at both ends of the tunnels, which act automatically, the ones in front being closed by the pressure of the atmosphere, when the car is put in motion, while the rear ones are opened by the same pressure being exerted through the bell-mouthed jackets. The trip to Worcester showed how well the apparatus worked. The air in the car was kept sweet and pure, and it was absolutely free from cinders, dust being out of the question, as the recent rains had laid it. The trial was made under some disadvantages, the principal being that the induction pipes were of small caliber, and therefore the supply of air was, to some extent, limited. This, however, proved no defect in the system, but rather showed that any amount of air desired could be obtained by the enlargement of the induction pipes to the proportions desired. As it was, however, the day being cool and cloudy, the supply of air was ample to keep the atmosphere of the car fresh and clean. It may be stated that, by this system, in the hot summer weather, not only could the air of the car be kept pure and free from dust and cinders, but it could be cooled to a delightful temperature by the use of ice in the reservoir, or what would, perhaps, be better, ice and water combined.

"The following is the result of Mr. Lindsay's tests, as given by himself:

"'The velocity of the air entering through the ventilating pipes and also of that passing out through the exit flues was taken at several different times. The mean of these results thus obtained gives, I think, a fair determination of the amount of pure air entering and vitiated air leaving the car.

"'Mean of several determinations of the velocity of the air entering the car by the ventilator pipes, 1,243 feet per minute.

"'Mean of several determinations of the velocity of vitiated air leaving the car by exit pipes, 768 feet per minute.

"'Mean amount of air entering by ventilator pipes, five inches in diameter (two in number), per minute, 340·6 cubic feet.

"'Mean amount of vitiated air leaving by exit pipes, three inches in diameter (twelve in number), supposing the same velocity in each, per minute, 451·6 cubic feet.

"'A passenger car of ordinary size has a capacity of about 3,500 cubic feet. According to the above results, a volume of air equal to the cubical capacity of the car enters it in about ten minutes, when running at ordinary express speed. This air, moreover is free from all dust and cinders, in fact, clean, which is not the condition of that admitted by the usual method of ventilation. There is a very noticeable difference between the quality of the air in the car ventilated by this method and the ordinary passenger car.'"

Under Water Lamps.

A new method of illuminating the tanks at the Royal Aquarium, Westminster, was lately shown by means of the "Faure" electric battery, and which, so far as it went, was of a successful character. The lights shown were, to the number of six, submerged in the tank at the foot of the west staircase with excellent effect, showing up every fish and plant with great distinctness—a result impossible to attain under the old system of gas illumination. One of the great advantages of the electric over the gas lighting system is that the fish do not seem to mind in the least the close proximity of the incandescent lamps, while at the same time they do not suffer from the noxious emanations evolved during the combustion of gas. Under Mr. Faure's system a steady light of almost any intensity can be obtained, while the engines, which can be run without cessation during the whole of the twenty-four hours of the day, effect a great saving by their power of storing the electric energy, while at the same time they obviate the danger of a sudden accidental extinction of the other light employed. The electricity used for the lighting of the tank was generated in Woolwich and carried down to the aquarium, where it arrived but a short time before it was used.

Wind Power for Electric Lighting.

In an address delivered before one of the sections of the British Association, at York, Sir W. Thomson spoke of the utility of wind power as of possible service in electric lighting. He said that cheap windmills, in connection with dynamo-electric machines and Faure's batteries, would supply a great want. A Faure cell, containing 20 kilos of lead and minium, charged, and employed to excite Swan's lamps, would give 60 candle hours—that is, an aggregate light of 60 candles for one hour, or the light of one candle during 60 hours. The charging of such a cell could be done, with good dynamo economy, in any time from six to twelve hours, or more; and the charge might be drawn off, very economically, in any time of from five hours to a week or more. As calms do not often last above three or four days at a time, Sir W. Thomson argues that a five days' storage capacity would, in general, be sufficient. One of the 20-kilo cells already mentioned, charged at any time when the windmill works for five or six hours, could be used six hours a day for five days, giving a 2-candle light. Thus 32 cells would be required to give the light of four burners of London 16-candle gas. The probable cost of dynamo machine and accumulator (which we may take at £250 in this case) would not, in Sir W. Thomson's opinion, be fatal to the plan here sketched out, if the windmill could be obtained at anything like the cost of a steam engine of equal power. Sir W. Thomson confesses, however, that windmills are very costly machines; and without inventions not yet made, could not be economically used to give power for storing up electricity in Faure cells or in any other manner.

A Portable Electric Lamp.

Recently, while the mechanical section of the British Association were discussing the means of using the electric light in coal mines, Mr. Swan, inventor of the "Swan lamp," made a remarkable statement. He produced an electric lamp of two candle power, quite detached from any wire, and portable, which could be kept lighted for six hours by a two cell Faure secondary battery. The weight of the battery would not exceed ten pounds, and to charge it afresh it would only be necessary "to place it for a time in connection with the wires of a dynamo near the pit's mouth." The battery and lamp need never leave the pit. Sir J. Hawkshaw greatly approved this lamp, and well he might. The germ of a portable and handy electric lamp, unconnected with any wire, and fed at intervals only as an oil lamp is, must lie in that rude specimen shown.

Fans in a Hospital.

A large hospital at Madras, India, is ventilated by means of a system of fans operated by steam power. The machinery is simple, the hundred fans presenting an area of 2,050 square feet, being swung by a line of steel wire about 1,700 feet in length. The fans swing together with a steady sweep of seven or eight feet, and work smoothly and silently. The long swing and uniform motion insure the desired movement and change of air without risk of draughts.