Running Locomotives with Natural Gas.

For some time, it seems, experiments have been quietly conducted by Gen. Supt. W. W. Worthington and the General Master Mechanic of the Fort Wayne, Cincinnati & Louisville road, with a view to the transportation of natural gas in tanks, for use in heating and lighting cars and for fuel in the fire box of the locomotive.

The experiments have been successful enough to warrant the hope that the time is soon to come when the public will be able to ride on smokeless and cinderless cars, and where the entire heat, light, and power come from natural gas. The idea at the base of the experiments was that the pressure that comes from the depths of the earth might force the gas in a condensed form into wrought iron or steel receptacles, which could be sealed up and carried any distance, then attached to pipes and used in the ordinary manner. A special to the *Chicago Tribune* says of it:

The first trial was made at Montpelier, Ind., where there are two strong gas wells. A wrought iron cylinder, 18 feet long and 2 feet in diameter, with heavy ends screwed in, was attached to the biggest well. The cylinder had been subjected to careful and scientific tests at the shops, and was provided with gauges to register the pressure. This well has a rock pressure of 450 pounds to the square inch, and when it was turned on, the gauge on the cylinder fairly danced round, and in a minute almost came to a standstill, showing the cylin der was full and would register no more. The cylinder was then hoisted into a freight car and brought to Fort Wayne. Here it was taken into the company's shops and attached to the usual natural gas burning apparatus, with a "regulator" that controlled the enormous pressure under which the gas had been forced into the cylinder, so that it flowed out in a steady, regular current. This "regulator" was manufactured at Pittsburg, Pa., and is in use, it is said, wherever natural gas is used; and when the gas flows through it, it reduces the pressure from 450 pounds to the square inch, or whatever it may be, to 1½ ounces, at which pressure natural gas is burned. The gauge showed that the gas in the cylinder had lost but little of its pressure, and it supplied light to the gas burners in the shops for several hours, besides heating one large stove and one forge.

The company, being satisfied with the tests made that gas could be transported and used in this manner, are making preparations to test its practicability for use on the road. For this a trial tank car of the shape and size of those used by the Standard Oil and various tank line companies of the country is being built. It will be of steel sections screwed together and banded with wrought iron welded on at the joints, so as to stand the great pressure. This car will be hauled just back of the tender, which will only be used to carry water, and a pipe from it will lead through the regulator placed on the tender to the fire box of the locomotive. Its capacity will be equal to as many thousand cubic feet of gas as will represent enough tons of coal to make the entire trip over the road. At different stations along the line, arrangements will be made for tapping the wells and filling the tank car at any time it runs low.

It is almost impossible to estimate the enormous saving that will follow this use of natural gas for fuel. It is said that the Lake Erie & Western Railway, which runs through the great gas fields of Ohio and Indiana from Findlay, O., to Tipton, Ind., has a machinist there watching the experiments, which may be of colossal value to that road. The General Master Mechanic and Master of Transportation of the Pennsylvania lines west of Pittsburg are also said to be there in the interest of their roads, and the experiments are being watched by the railway world with great interest.—*Amer. Engineer.*

[The pressure above indicated, 450 lb. per square inch, is equal to 30 atmospheres, or the compression of 30 cubic feet of gas into the space of one cubic foot. The experimental cylinder above mentioned, at 450 lb. pressure, was capable of carrying close on to 1,700 cubic feet of gas.—ED. S. A.]

A THEORY of obesity, proposed by M. Leven recently, and described before the Societe de Biologie, is that it is a nervous disorder, and to be treated by avoidance of mental and physical fatigue, and a diet of eggs, soup, milk, rice, and potatoes.

A REMARKABLE RAILWAY WRECK.

The wreck of two passenger trains on the Rochester (single track) division of the New York, Lake Erie, and Western Railway, one mile east of Avoca, on Tuesday, the 17th of January, was an interesting one, aside from the sad event connected therewith. The train from Rochester, No. 18, was drawn by engine 260, Frank H. Maynard engineer, and the train from Elmira, No. 107, by engine 69, Frank Marsh engineer. The blame has been placed upon the train dispatcher, but it would seem to be as just to attribute the accident to the system of train management. On the Pennsylvania Company's railways what is known as the "double order system" is in vogue. The train dispatcher will call two stations nearest the approaching trains, and issue an order to the engineers and conductors of the two trains to be affected. For instance: "Conductor D and engineer E, train 39, will meet and pass conductor F and engineer G, train 40, at York." The operators will each repeat the order back to the dispatcher and wait for his "O. K." before allowing the trains to proceed. On the New York, Lake Erie, and Western a separate order is issued for each train, repeated, and "O. K.'d," as common to all systems.

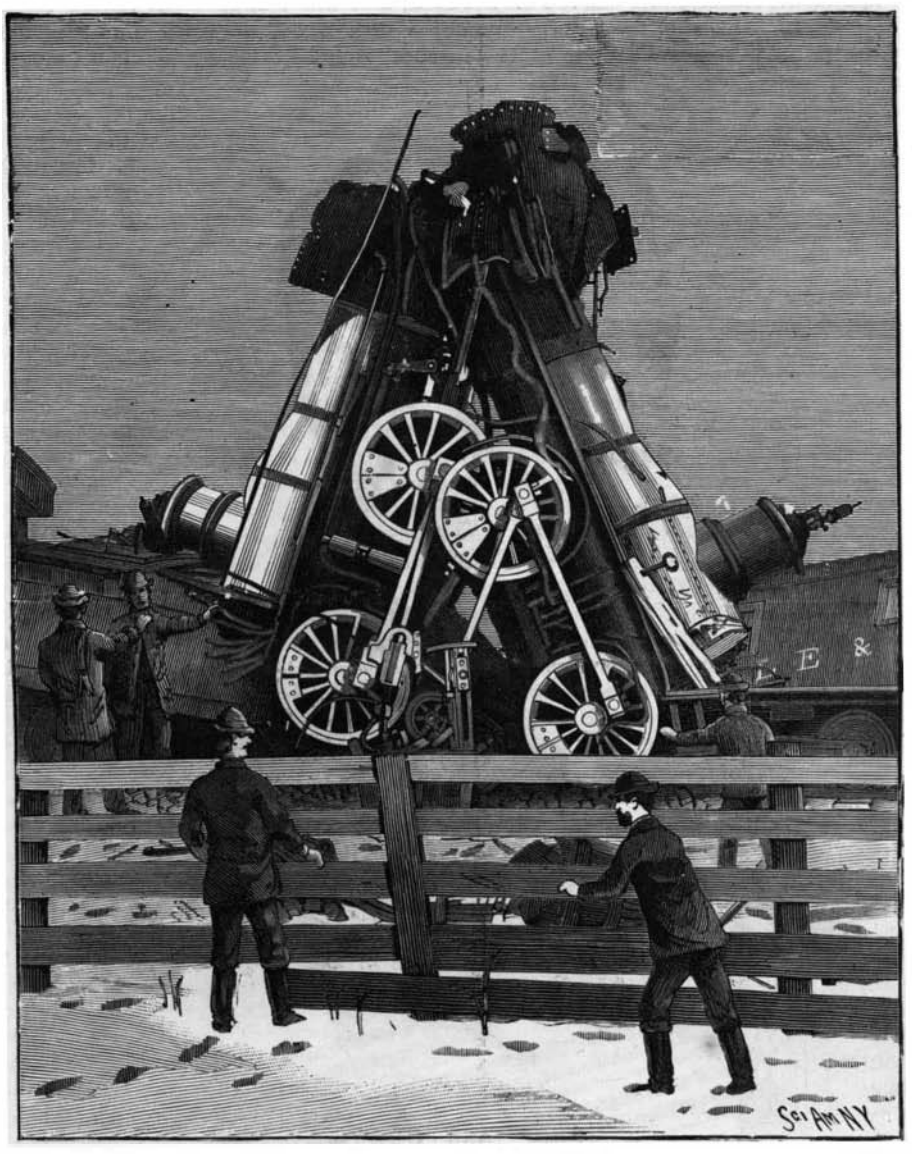
The confusion leading to the wreck near Avoca seems to have arisen from train 18 running behind train 107 instead of ahead, as usual when on time, and the train orders for the two getting confounded in the mind of the dispatcher. The dispatcher discovered his error, it is claimed, almost immediately, but on calling Avoca could get no response, as the operator had left his instrument to attend to the duties of baggageman or express agent, it being the custom at small stations to place the several titles and duties upon one man. Train 18 was fifteen minutes late, and Engineer Maynard remarked to his fireman, Frank Marsh, Jr., that he would have to "let her out." Both trains make high speed between stations. They met on a sharp curve. Engineer Marsh saw the down-coming train in time to pull the air brake lever and jump, his fireman having preceded him. Engineer Maynard was on the outside of the curve, and presumably did not have as good a view of the track ahead, a bit of woods with thick underbrush bordering the railway on the inside of the curve hiding the track ahead.

The curve is a short one, and on either side lies a mile or more of straight track, so that ten seconds difference in the time of one of the trains would undoubtedly have prevented the accident. Maynard's fireman happened to look ahead from his side of the cab at the right instant, shouted, "There they are, Frank," and leaped just as the trains came together. Maynard pulled the air brake lever just in time to set the brakes. It is apparent, also, that he put his head out of the cab window, as if to escape being crushed, but the cab was so broken that the hard wood frame acted like a huge pair of shears, cutting his head completely from his shoulders, so that it fell by the side of the track upon the snow. It is apparent that the air brakes saved all others on the trains from instant death. Nearly every one received a bruise of some kind, but none of them serious. It is seldom that two engines more completely wrecked are seen. Equal to each other in every particular, they met and stood erect as if to wrestle, their driving wheels wedged together, and machinery almost completely stripped from the boilers. The accompanying cut is from a photograph taken within an hour after the collision, by I. F. Moore, of Avoca. It was probably the most picturesque wreck, so far as the locomotives are concerned, that has occurred in years.

The unlucky incident is worthy the study of railroad managers. The writer is informed that two men, working twelve hours each, do the train dispatching on the division where the accident occurred, and he knows personally of dispatchers who work eight hours without cessation at their instruments in handling the many trains of a trunk line in New York State, besides doing a large amount of other telegraphic work, and then completing a day's work of eleven or twelve hours, often more, in making out the daily reports. This is done seven days in the week, and vacations come very rarely. Train management requires such a clear head that it cannot be done efficiently with the dispatcher constantly overworked.

A law limiting the hours of office work for a train dispatcher to eight would certainly insure greater safety to the public, and, it would seem, enable the dispatcher to handle his multitude of trains with greater facility. Further legislation to secure the constant attention of an operator at his instrument, undiverted by the duties of ticket agent, baggage or express agent, also seems advisable. Accidents so destroy public confidence in the safety of a railway that not only destroyed life and property, but diminished patronage, must be counted in footing up the loss.

The coroner's jury which investigated the cause of the death of Engineer Maynard found that an error in the train dispatcher's office at Rochester. The jury also found: "The company required Train Dispatcher Sauerbier to keep an account of and report daily all cars ordered, received, and on hand at date on the divisions of which he had supervision. The said divisions comprised about 170 miles of track, over which 36 trains passed daily. His duties as dispatcher required him to serve continuously twelve hours out of the twenty-four. We recommend that the railroad company employ a person other than the dispatcher to keep and make such car reports. We further find that said dispatcher had more duties to perform at the time of making such error than should have been required."



A REMARKABLE RAILWAY WRECK—NEW YORK, LAKE ERIE, AND WESTERN R.R.

Bricklayers in Frosty Weather.

A writer in the *Building News* (London), referring to a report issued from the Foreign Office, which he claims contained nothing but what every practical bricklayer in England already knows, offers the following substitute, which he thinks every bricklayer does not know:

Mortar made in the following manner will stand if used in almost all sorts of weather: One bushel of unslaked lime, three bushels of sharp sand; mix 1 lb. of alum with one pint of linseed oil, and thoroughly mix this with the mortar when making it, and use hot. The alum will counteract the action of the frost on the mortar.

Tests for Swords and Cutlasses.

In order to more completely insure the good quality of the swords and cutlasses issued to the British navy, orders have been given for the following tests to be applied to a large number of cutlasses which are to be repointed and reduced to a uniform blade length of 27 inches. First the sword is to be subjected to a direct vertical pressure on the hilt in a machine specially constructed for the purpose, and it is required to stand a pressure of 40 lb. without deviating from the straight line.

Then additional vertical pressure is to be applied in the machine until the sword is bent so that the distance from point to hilt is reduced 3 inches. Finally the blade has to be bent round a suitable curved block, so that every portion of it partakes of the bend, the distance from point to hilt being reduced 2½ inches. The sword also has to be struck with moderate force, back and edge, on a block of oak to test the soundness of the hilt.

The Lick Observatory Astronomers.

At a recent meeting of the Board of Regents of the University of California, the special committee appointed to consider the resolution accepting the resignation of Edward S. Holden as president of the university, and resolutions appointing the director of and the astronomers in the Lick Observatory, and resolutions appointing a secretary and librarian, and also a machinist, a laborer, and a janitor, reported through A. L. Rhodes.

The resolutions, as adopted, are as follows:

That the resignation of Edward S. Holden as president of the university be accepted.

That Edward S. Holden be, and he hereby is, appointed as director and astronomer of the Lick Observatory, subject to the control of the Board of Regents.

That S. W. Burnham, A.M., be, and he hereby is, appointed as astronomer, with a salary of $3,000 per annum. That J. M. Schaeberle, A.M., be, and hereby is, appointed astronomer with a salary of $2,000 per annum.

That J. E. Keeler, A.B., be, and he hereby is, appointed astronomer with a salary of $1,400 per annum.

That E. E. Barnard be appointed astronomer at $1,200 per annum.

That the following be appointed: John McDonald, machinist, $700 per annum; Chris. McGuire, laborer, $720; and Charles Harcort, janitor, $720.

That a secretary and librarian be appointed.

That a committee of three regents be appointed, who shall be authorized to make necessary arrangements for the conveyance and delivery of the Lick Observatory, the lands upon which it stands, and the property and money in the hands of the Lick trustees, which are required by the deed of trust to be turned over and delivered to the Board of Regents.

The committee to which was referred the orders of the board relating to the Lick Observatory submitted the following report, which was adopted:

That the official designation of the Lick Observatory and telescope on Mount Hamilton shall be "The Lick Astronomical Department of the University of California." The balance of the $700,000 given by Mr. Lick for the foundation and endowment of the observatory, and such other sums as may from time to time be given, shall be known as the Endowment Fund of the Lick Astronomical Department of the University of California. That students who are graduates of the university and colleges of like standing shall be received at the observatory as students to pursue a higher course of astronomy.

The resignation of the president of the university is to take effect when the observatory is formally turned over to the regents. Prof. Holden's salary is $5,000 per annum.

Calcareous Water.

The Weavers' School of Aix-la-Chapelle writes as follows to the *Centralblatt f. d. Textil-Industrie:*

"The reply by another correspondent published by you compels us to again take up the subject. The writer advises to soften the water by an addition of milk of lime. We, however, would most seriously warn parties against doing it. It is true that carbonate of lime in water can be precipitated by milk of lime, because the excess of carbonic acid, without which the lime cannot remain in solution, becomes fixed. But the vital question in the matter is, How much milk of lime is to be added? The operator would have to know to a nicety how much carbonate of lime is contained in the water, and how much caustic lime is contained in the milk of lime.

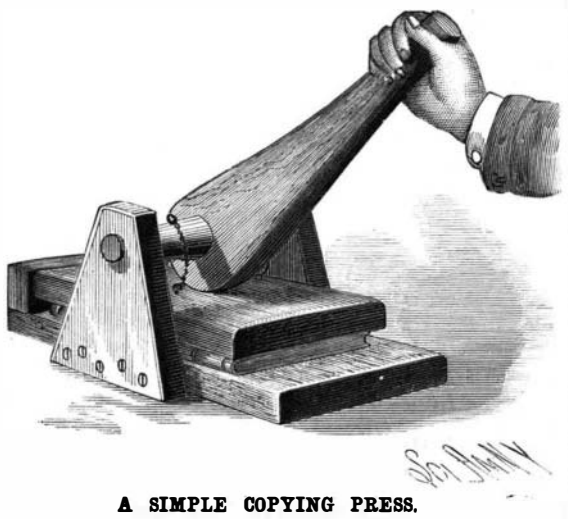
"But can this be established with precision in every case? To be added to this difficulty is the fact that milk of lime cannot be kept in the open air, because the caustic lime will change into carbonate of lime, whereby the entire solution loses its strength. The greatest danger, however, is that the operator will add too much milk of lime to the water, which addition, in place of making the latter softer, will make it very hard; and if he uses it at once, when the reaction of the water containing an excess of milk of lime is still alkaline, he may experience a number of undesirable accidents, both in washing and dyeing.

"The main point of the question, however, has not been touched upon at all by the respondent. The hardness of the water is most generally due, not to carbonate of lime, but to sulphate of lime (gypsum). Can this also be precipitated with milk of lime? As we stated in our answer, nothing is good except the addition of solution of soda to the boiling water, which process has time and again shown its efficacy, and has therefore stood the test of experience. The gypsum is thereby at once converted into carbonate of lime, and since all excess of carbonic acid has been expelled by boiling, it is precipitated at once."

MOISTURE-PROOF glue is made by dissolving 16 oz. of glue in 3 pints of skim milk. If a still stronger glue be wanted, add powdered lime.

A SIMPLE COPYING PRESS.

We illustrate in the present issue a very simply constructed copying press. Its construction is so clear that little description is required. It was devised by Mr. O'Rourke, one of the constructing engineers of the Poughkeepsie bridge. A wooden cam rotates in suitable bearings, and when turned, by pulling forward the lever, forces the platen downward upon the copying book. When the lever is pushed backward, it not only relieves the platen from pressure, but also raises it. This it does by a short chain or wire attachment which

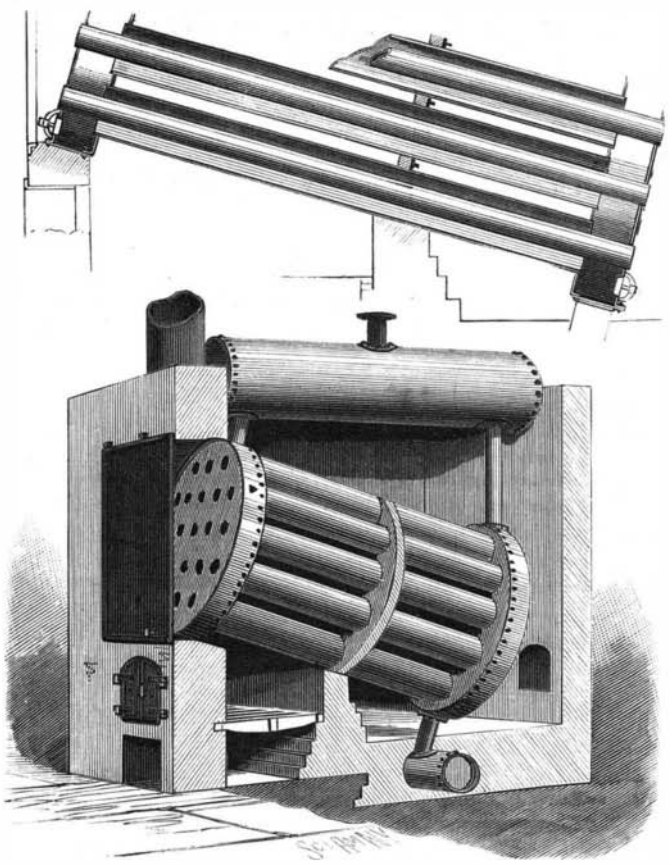


A SIMPLE COPYING PRESS.

is wound around the axle or drum to which the cam is attached. It is all made of wood, except as regards the nails or bolts and the chain.

AN IMPROVED STEAM BOILER.

A steam boiler designed to give a maximum amount of heating surface, in order that steam can be generated with the smallest possible amount of fuel, has been patented by Mr. Oliver H. Gentry, of Opelousas, La., and is represented in the accompanying illustration. The boiler is preferably set at an inclination, as shown in the view in perspective, and each of its ends consists of a circular drum, through which extend flue tubes, passing through both front and rear drums, these flue tubes being surrounded by water tubes, opening into the interior water spaces of the drums. A mud drum is arranged transversely under the lower side of the rear drum, with which it communicates through a short vertical pipe, and a steam drum arranged horizontally over the boiler is in communication with the top portion of the water drums at both ends by vertical pipes. The tubes are expanded in the tube sheets, and the setting shown is designed to represent about the proper angle to insure the best circulation. When the boiler is filled, the water in the drums and tubes entirely surrounds the flues, and the products of combustion, after circulating around the tubes until they reach the rear drum, are deflected downward to its rear side,



GENTRY'S STEAM BOILER.

thence passing forward through the flues to the stack at the front, up which they escape.

IODIZED starch has been recommended as a substitute for iodoform, on the ground that iodoform owes its power to the iodine given off from it.

A New Departure in Brazing and Welding.

Mr. Thomas Fletcher, the well known gas engineer, writes to the *Journal of the Society of Arts*, London, as follows:

"The cheapening of oxygen by Brin's process of manufacture has put into the hands of metal workers a new power. I have recently made a few experiments with the compressed oxygen and coal gas, and found that with ½ inch gas supply a joint could be brazed in a 2 inch wrought iron pipe in about one minute, the heat being very short, the redness not extending over 1 inch on each side of the joint. The appearance of the surface after brazing led me to experiment further with welding—a process which is not possible with ordinary coal gas and air, owing to the formation of magnetic oxide on the surfaces. Contrary to my expectation, a good weld was obtained on an iron wire ½ inch diameter with a very small blowpipe, having an air jet about $\frac{1}{32}$ inch diameter.

"This matter requires to be taken up and tried on a large scale for such work as welding boiler plates, which, it appears to me, can be done perfectly with far less trouble than would be required to braze an ordinary joint. The great advantage of this would be that the boilers would require no handling, but could be welded with an ordinary large blowpipe in position, and with about one-tenth the labor at present necessary. The cost of the oxygen is trifling, and it is evident from the results obtained in brazing that the consumption of gas would be considerably less than one-fourth that necessary with an air blast, irrespective of the fact that welding is possible with an oxygen blast, whereas it is not possible if air is used. The surface of iron heated to welding heat by this means comes out singularly clean and free from scale, and a small bottle of compressed oxygen with a blowpipe and a moderate gas supply would make the repairs of machinery, boilers, brewing coppers, and other unwieldy apparatus a very simple matter. The trouble and difficulty of making good boiler crowns, which so frequently come down, would be very small indeed when the workman has an unlimited source of heat at command, under perfect and instant control."

The Manufacture of Aluminum.

Works for the manufacture of sodium by the Castner process and its conversion into aluminum under the process of Mr. James Webster are now being erected by the Aluminum Company, of St. Mary Axe, London, at Oldbury, near Birmingham, which, it is expected, will bring an important trade to the district. The process of sodium production, which has been invented by Mr. H. Y. Castner, New York, has already been described.

By this process the cost of sodium is reduced from 4s. to 1s. per lb., and of aluminum from 60s. to less than 20s. per lb. The aluminum is produced in pigs of 4 lb. weight. The same sized pig of the alloy known as aluminum bronze, copper and aluminum, weighs 12 lb. —a fact which strongly illustrates the relative lightness of aluminum. Its value is further increased by its tensile strength and its non-liability to oxidize. It is obvious that the manufacture of this reliable metal upon an extensive commercial scale at a much lower cost than hitherto involves important consequences to English metallurgical industry.

The new works at Oldbury occupy 4½ acres of ground, and they will be capable of producing £300 worth of aluminum per day. The number of men to be employed is not yet definitely decided upon, and in aluminum manufacture extent of production is indicated more by the amount of machinery plant than the number of workmen engaged. At Oldbury there will be four furnaces, each with five chambers, for the manufacture of sodium, and a number of other furnaces which have yet to be erected will be used for making chloride of aluminum and the aluminum itself. The furnaces will be fired by eight Wilson gas producers. The gas from these will be carried to the furnaces through pipes, and as there will be a separate valve to each furnace, the supply of heat will be regulated without difficulty. All the coal consumed at the works will be brought by canal. There is a special creek running into the works. On the other side of the works runs the line of the Great Western Railway Company. Just opposite the works, on the other side of the canal, is a manufactory of chemicals, and from this establishment will come the soda and certain of the other materials used in the production of aluminum. At the Solihull works of the company the co-metal is already being turned out, and is being received with considerable favor. Many metal-working firms are using an alloy of aluminum and copper—90 per cent of the latter to 10 per cent of the former—and express much satisfaction with its qualities. The new works are being rapidly erected, and it is expected that full work will be begun in March. One of the chimneys, which is 150 feet high, with an internal diameter of 6 feet, is already completed; and another, 180 feet in height and 8 feet across at the top, is already about half built.—*Iron.*