Cast Iron Beams.

Absolute strength in the iron of large castings is of little consequence unless they cool, after pouring, in such a manner as not to leave them subject to considerable internal strains. We know that the late Professor Hodgkinson found that with the iron he experimented upon the compressive strength was six times that in tension, and hence that the bottom flange of a cast iron girder should have six times the sectional area of the top flange. But very few, if any, engineers adopt such a proportion, as the casting would, in all probability, crack in cooling. Most of my audience have seen the cast iron bridge over which the London and Northwestern Railway crosses the Regent's Canal. The first girders for this bridge were cast at the Tinsley Park Works. The iron made there was very hard; and I have been told by my friend, Mr. Shanks, who was engaged there at the time, that it would chill to a depth of two inches. It was used, among other things, for making rollers to roll steel.

The Regent's Canal bridge drawing was sent down there, and they made the patterns and cast the girders. They broke through and through in cooling. Then they altered the patterns, and by pulling off the sand from the thicker portions of the castings, so as to equalize the cooling, a number were cast with the loss of one out of every six. At last, six were sent up to London, and of these every one broke in a thunderstorm. Other girders were then cast of different form. Castings, overstrained in cooling, are apt to break under even a moderate degree of vibration; and the late Mr. Rastrick, once of the Bridgenorth Foundry, and afterward Engineer-in-Chief of the London and Brighton Railway, once stated in evidence how a number of cast iron boilers he had made cracked open after a peal of thunder.—*Z. Colburn.*

CENTRAL POWER LOCOMOTIVE.

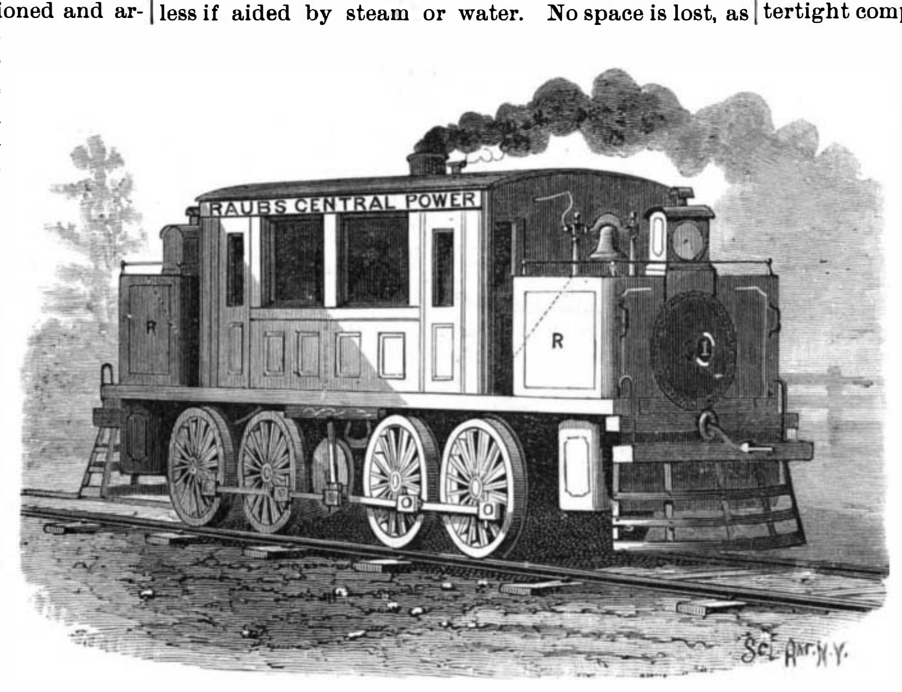
There is now being tested upon the Erie Railroad a locomotive of uncommon appearance, built by the Rogers Locomotive Works after designs by the inventor, Dr. Christian Raub, of this city. The four driving wheels upon each side are united by a rod, connected at the center to a wrist pin, placed upon a disk crank on the end of a shaft journaled between the middle wheels. The cylinders are placed vertically in line above the ends of this shaft.

The two return flue tubular boilers are placed end to end, with the fire boxes adjoining each other. Upon each side of each boiler is a fire door, so that each furnace may be fed from either side. The boilers are united by a tube to equalize the steam pressure, and one safety valve answers for both. There are 132 two-inch flues, 66 inches long, in each boiler. The fire box of each boiler is 56 inches long by 33½ inches wide, and from the grate bars to the crown sheet is 42 inches. The grate surface is 13 square feet, the flue surface 370 square feet, and the total heating surface 420 square feet. There are six water tanks, three at each end of the locomotive, having a combined capacity of 2,000 gallons. At each end are also two coal boxes, each holding three-quarters of a ton.

The cylinders are 16 inches in diameter by 24 inches stroke. The drivers are 62 inches in diameter. The extreme length of the engine is 40 feet, of the wheel base 19 feet 5 inches, and the height from rail to top of cab is 13 feet. The engine is so proportioned and arranged that each half of the total structure, whether divided longitudinally or laterally, is an exact counterpart of the other half, both as regards weight and measure. The consequence is that the center of gravity is at the intersection of the longitudinal and transverse center planes of the entire locomotive. The motive power is placed in the central transverse vertical plane of the engine.

The boiler flues terminate in a smoke chamber at the ends of the locomotive, but, instead of allowing the heat and gases to escape through smokestacks at the ends as in the ordinary locomotive, they are conducted through return flues of a larger size to a smoke chamber, from which leads a stack standing in the center of the locomotive.

The engine shown in the engraving was designed for heavy work, and as it has no dead weight, its entire power can be utilized.



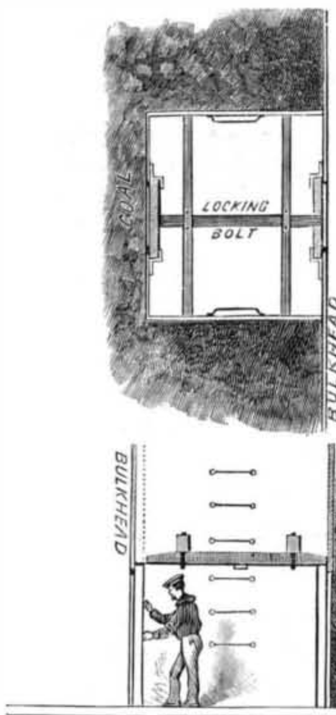
RAUB'S CENTRAL POWER LOCOMOTIVE.

Reward Offered for a New Invention.

The mining owners of Ostraw Rarwin (Austria) have decided to offer a prize of 1,000 ducats for the best invention for preventing accidents in firing and blasting in dusty or gaseous coal mines, or rendering the operation harmless. The invention should fulfill the following conditions, namely: 1. Its use, effects, or explosion should not cause the coal dust to ignite. 2. It should not produce, after the explosion or use, more injurious gas than through the methods heretofore employed. 3. No specially difficult, dangerous, long preliminary arrangements or complicated apparatus should be required in using, setting up, loading, transporting, or lighting. 4. Should not by its use and result be much more expensive than the former blasting methods. Applications should be sent before the end of 1886 to the K. K. Berghauptmannschaft at Vienna.

SAFETY BULKHEAD DOORS.

The cut illustrates an arrangement of bulkhead doors for steamers. For the safety of ships provided with watertight collision bulkheads, it is imperatively necessary that dependence should not be placed on firemen and stokers for closing the doors. It seems clear that had the bulkhead door of the Oregon been closed before the collision occurred, that ship would



HEILL'S SAFETY BULKHEAD DOORS.

still have been afloat. By the construction shown the doors cannot be left open, even when the coal passers are at work. The door in the bulkhead, instead of entering into the coal bunker, has a chamber or well (built watertight) in front of the door of the bulkhead. This well has a second door fitted in it the same as the other one, both doors to slide easily up and down, and a locking bolt is carried on guides on a level with the top of these doors when they are shut down. This bolt extends exactly from the back of the one door over the top of the other door, and it always bears against the back of the door that is up, and extends over the top of the door which is down. It is thus clear that so long as one door is open the other must remain shut until the other door is also down, to permit the locking bolt to slide from off the top of the one door over that of the other. The coal trimmers bring the coals into the compartment or well, they close the open door, slide the bolt over it, and then open the other. All may be done in a few seconds, even by manual effort, and in less if aided by steam or water. No space is lost, as the well is filled with the coal first used. Steps are fitted inside the well to the deck to provide means of exit. Dearly bought experience proves that no reliance whatever can be placed on firemen or trimmers to shut the doors, as they regard it as unnecessary tyranny to be told to shut them when they are so soon to be opened again, and they consequently shirk it on all occasions.

This interesting invention is due to Mr. Laurence Heill, C.E., of Glasgow, Scotland. He refuses to patent his invention, preferring to dedicate it to the service of the public. It really seems as if it would operate as an insurance against sinking and be a factor in the rating of a ship comparable to the bulkhead itself.

The Latest Summary of Pasteur's Work.

Up to April 14, Pasteur has inoculated 688 persons, presumably bitten by mad dogs, with only one death. He had also inoculated 19 Russians bitten by a mad wolf. Of these 19, 3 have died from hydrophobia—about 16 per cent. The usual per cent of deaths from the bites of mad wolves is said to be about 67. Since April 14, Pasteur has treated other Russians bitten by mad wolves and mad dogs. One of the former recently died from the effects of his wounds; one of the latter from hydrophobia, after having been submitted to treatment. This makes in all 720 cases treated, with a total of 5 deaths from rabies, despite treatment. Pasteur has found that the rabies resulting from wolf bites is the same as that of dogs, and only more dangerous because the bites of wolves are more numerous and severe.

Unprofitable Customers.

Almost every machine-shop owner has suffered more or less from the friend who drops in to have a rivet put in his knife, the spring of his pistol fixed, or some other one of the million little odd tinkering jobs done. Of course, he does not expect to pay for it, "it is such a trifle, you know," nor does the proprietor like to make a charge, and thereby lay himself open to being thought "small." When a charge is made, it is seldom commensurate with the cost of doing the work, and rarely, if ever, pays for the annoyance and diversion from more important work. Such jobs, it is safe to say, are always distasteful, but the proprietor does not know exactly how to refuse to do them. Not only do they take more time than would be supposed, but considerable time is wasted in getting back to regular work, and in many cases other employes have to wait on the one doing the job, machinery is idle, and the minds of the men have to go back and gather up the threads of the work in hand. Such jobs are an imposition, not intentional perhaps, because those imposing them are ignorant of the annoyance they cause, but this does not lessen their cost in any measure. The machinist who does not want such work should plant himself squarely against it, and refuse to take it at all. A few words of explanation would satisfy any reasonable applicant.—*Industrial World.*

Testing Watertight Compartments.

Warned by the fate of the Oregon, the Russian Government, says *Engineering*, has been inaugurating an exhaustive test of watertight compartments, which it contemplates applying to all new vessels, and probably to older ones as well. The man-of-war selected was the corvette cruiser Vitiaz, which was finished last autumn, and is under sailing orders for the Pacific this month. Five weeks ago an intimation was conveyed to the dockyard authorities at Cronstadt that the watertight compartments would be tested in succession, and instructions were given to survey them afresh, and make good any defects that might be discovered. If the official report is to be believed, every effort was made to meet the wishes of the Admiralty, yet when the compartments were actually filled with water the fluid gushed through numerous apertures which had escaped the eye, and in some cases to an extent which would have been troublesome at sea after a serious accident. To secure perfection several of the compartments were filled two or three times, and it was only after a deal of door adjusting and leak stopping that the corvette was pronounced fit to proceed to sea. A final test was then applied in the presence of the higher Admiralty authorities, a number of the nine large watertight compartments being filled at once without any leakage. Besides insuring the rectification of all defects in the watertight compartments, it is claimed in the report that the tests have proved of great service in training the crew; they have promoted confidence in the buoyancy of the vessel, and have led to several improvements of an important character. It has been suggested that in this year's naval maneuvers in the Baltic the tests should be continued by ordering so many of the watertight compartments to be filled, in the event of a torpedo cutter approaching within hitting distance of a man-of-war; but the defects revealing themselves in the case of the Vitiaz have made the authorities apprehensive of ill results, unless harbor tests are applied beforehand.