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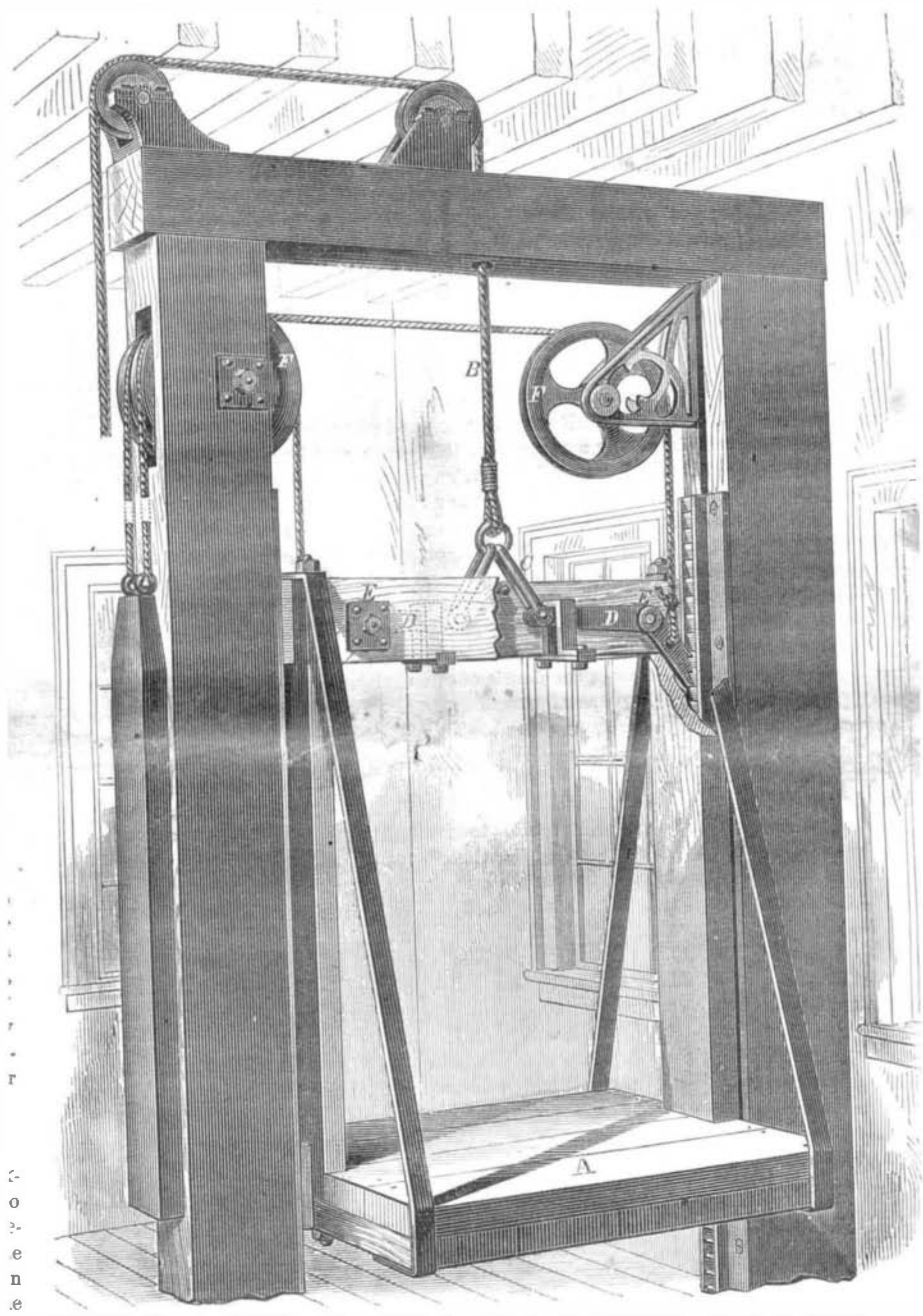
Improvement in Safety Hoisting Apparatus.

The use of cams and levers and of springs and levers for preventing the fall of the cage of a hoist, on the breaking of the hoisting rope, is not new; but, unfortunately, neither cams nor springs are wholly reliable, the latter, especially, are unreliable transmitters of power, losing elasticity when kept long compressed, and breaking when subjected to sudden strain. The object of the improvement, of which the accompanying engraving is an illustration, is to provide a certain means for preventing the fall of the cage in consequence of accident to the hoisting rope or chain. In this device the operation of the arresting levers is assured, as they are engaged with the rack instantly, in case of the breakage of the hoisting rope, by means of a counterbalance or weight, which, when the cage or platform is ascending, is moving in a contrary direction, thus giving the additional advantage of reducing the weight of the cage. Whenever the hoisting rope or chain ceases to act, the counterbalance rope comes into action and prevents disaster.

In the engraving, A, is the hoisting cage or platform, B, the lifting chain, attached by means of links, C, to the bell crank levers, D, having their fulcrums at E, and provided at their outer ends with teeth cut to fit the racks in the uprights of the framing. The ropes suspending the counterbalance weights are attached to the levers, D, at points outside their fulcrums, and pass over grooved pulleys, F.

The operation of the machine and its arrangements is apparent from an examination of the illustration. So long as the hoisting rope is held "taut," the levers, to which it is attached, are drawn away from the racks, and the machine operates freely; but the instant the hoisting rope breaks, or is slackened suddenly from any cause, the weight of the cage and its load comes upon the counterbalance ropes, the levers instantly engage with the racks, and the descent of the cage is prevented. There is no possibility of the device getting out of order, and ceasing to operate, except by the breaking of both the levers or one of the ropes; and the former may be made of the toughest wrought iron, and the latter may be wire ropes. A large machine is in operation at the works of Merrick & Sons, Philadelphia, Pa., and a working model may be seen at their office, 62 Broadway, New York city. Further information may be obtained by addressing the patentees at either place.



MERRICK & SONS' PATENT SAFETY HOISTING APPARATUS.

THE PARKHEAD FORGE.

The Parkhead Forge, Glasgow, is an extensive establishment, giving employment to seven hundred men and boys, but in consequence of the heavy nature of the work, the proportion of boys to men is smaller than in other branches of iron manufacture. The buildings cover several acres of ground, and are built in a most substantial style. On approaching the entrance to the Forge, the visitor is startled by the vibration of the ground under his feet, caused by the incessant blows of the steam hammers; and a peep inside reveals a scene of extraordinary activity. We shall briefly describe what came under our observation as we were shown through the work by one of the proprietors, and thus endeavor to convey some idea of what goes on in the place. The first department we entered was the rolling-mill, which is three hundred feet in length, and one hundred and fifty feet in breadth. At one end of the mill are arranged twenty-two puddling furnaces, and half a dozen reheating furnaces. The rolling and other machines are driven by a pair of horizontal engines of three hundred horse-power. The fly-wheel of the engines is eighteen tuns in weight, and it makes one hundred revolutions in a minute. The steam is supplied by fourteen vertical boilers, heated from the puddling furnaces. The iron is first rolled into bars, then cut up, re-heated, and either rolled into ship and boiler plates or wrought into pieces suitable for the forge. At one time the firm devoted attention to the making of armor plates, and their specimens stood the test of competition with those of English makers most creditably; and but for the want of convenience for carrying the plates—the nearest railway being a mile distant—Messrs. Rigby and Beardmore would have obtained a fair share of patronage from our own and other governments. The machines are capable of producing plates eight inches thick, and some of the plates made of that thickness have weighed twelve tuns each. At some of the puddling furnaces a new invention was being tested, and we were told that the most satisfactory results were being produced by it. Its object is to hasten and render more perfect the puddling process, by injecting a current of air at high pressure into the furnace. This is done by making the puddling bar hollow, and affixing to the outer end of it an india-rubber tube communicating with a powerful air pump. The patentee is Mr. Richardson, of Glasgow; and the advantages gained by the contrivance are that a charge of the furnace can be puddled in fifteen minutes less than the time required by the usual process, and that the iron produced is purer and tougher.

The forge or smithy is nearly as large as the rolling-mill, and its fittings are of the most gigantic kind. There are two steam cranes, capable of lifting fifty tuns each; four, forty tuns each; and four, twelve tuns each; and these are so arranged that a shaft or other piece of work may be passed from one to the other all over the shop. There are fifteen steam hammers, varying in weight, from seven tuns to two. Finished shafts—that is, finished so far as the hammering was concerned—were lying about in all directions, and so delicately had these been operated upon by the hammers that the surfaces were so smooth that turning would seem to be almost superfluous. Yet they were destined before leaving the place to be fitted into a lathe and turned with the greatest exactness. In the heating furnaces, and under the hammers, were a dozen more heavy jobs in the shape of crank shafts, rudder frames, and such like; and as these were in all stages of progress, a glance at them made plain the whole process of forging. In making a crank shaft, for instance, a piece of iron, eight feet or ten feet long, and of suitable diameter, is used as a "haft" or handle. At one extremity it is fitted with cross bars or levers, by which it may be turned on its axis; and the other end is shaped conveniently for having smaller pieces of iron welded to it. The welding end is placed in a furnace, and in about an hour and a half raised to a welding heat. The crane by which the iron is moved about is fitted with a chain collar or sling, in the loop of which the iron rests. The collar works in a pulley attached to the chain of the crane, and moves easily, so that the shaft may be readily turned on the anvil. When the proper degree of heat is attained, the stopping of the furnace is removed, the steam crane put in motion, and the gigantic bolt is swung on to the anvil of the steam hammer. Several large slabs of iron, similarly heated in another furnace, are then brought out and laid on the "face" of the "haft." A signal from the head forgeman, and the hammer drops upon the glowing mass, and a dazzling shower of sparks fly off in all directions. Again and again the hammer descends, the iron meantime being carefully moved about, so as to have the whole wrought into a homogeneous mass. Gradually the iron assumes a dull color, but not before the desired end is obtained. It then goes back to the furnace, comes forth glowing, has another addition made to its bulk; and so on. The most difficult part of the work is the formation of the crank-piece, which is forged solid, and forms a huge square projection on one side of the shaft. When the shaft has acquired the proper dimensions it is allowed to cool, and the haft-piece is cut off to be used again. As the shafts are turned down until a good surface is obtained, an extra inch or so is allowed in the forging. The heaviest work on hand, at the time of our visit, were the shafts for two iron-clad rams which are being built by Messrs. R. Napier & Sons for the British Government. These shafts were upwards of fourteen inches in diameter. All shafts are made in lengths of about twenty feet, and these are made with flanged ends so that they may be firmly united.

For dressing and finishing such huge pieces of iron as we have described, special and costly appliances are necessary. These are located in the machine shop, an apartment one hundred and fifty feet in length and fifty feet in breadth, both sides of which are lined with turning lathes, slotting and boring machines, and such like, of extraordinary size. One of the turning lathes is said to be the largest in the world; and some idea of its dimensions and form may be obtained from the fact that the crank shaft of the *Monarch*, though weighing thirty-two tuns, was turned in it without taxing its capabilities to the utmost. Some of the iron shavings lying about the vast machine were fully one inch broad and one eighth inch thick; yet these were turned off with apparently as little effort as if the material had been wood instead of iron. One of the boring machines is sufficiently powerful to drill a hole ten inches in diameter through a solid block of iron; and the largest slotting machine can send off chips a pound or two in weight. When the work leaves this department, it is generally quite ready for being fitted into its place. This firm pay nearly £40,000 a year in wages; and in all departments of the establishment, 15,000 tuns of iron, and 60,000 tuns of coal are annually used.—*The Ironmonger.*

THE LIFE OF IRON BRIDGES.

The Engineer says: "It may be assumed that a wrought iron girder bridge, subjected at intervals to a dynamical load not exceeding the fourth part of its powers of ultimate resistance, will be safe for traffic for a period of 328 years. This assumption is based upon the proviso, that the successive alternations of strain and repose should not be repeated more than 100 times during the same day. With the exception of some country lines and rural branch railways, the number of trains of every description passing over bridges in twenty four hours, considerably surpasses the limited number one hundred. Taking the traffic during the night to be only one third of that during the day, we may conclude that, as a low average, 200 trains pass daily over the majority of our metropolitan and suburban railway bridges, and as a maximum, the hardest worked member of the bridge tribe possibly undergoes as many as 300 alternate changes of active and passive conditions from sunrise to sunset. Adapting this calculation to our theory, we may estimate the life of the hardest worked railway girder to extend over a period, in round numbers, of 100 years, under ordinary circumstances.