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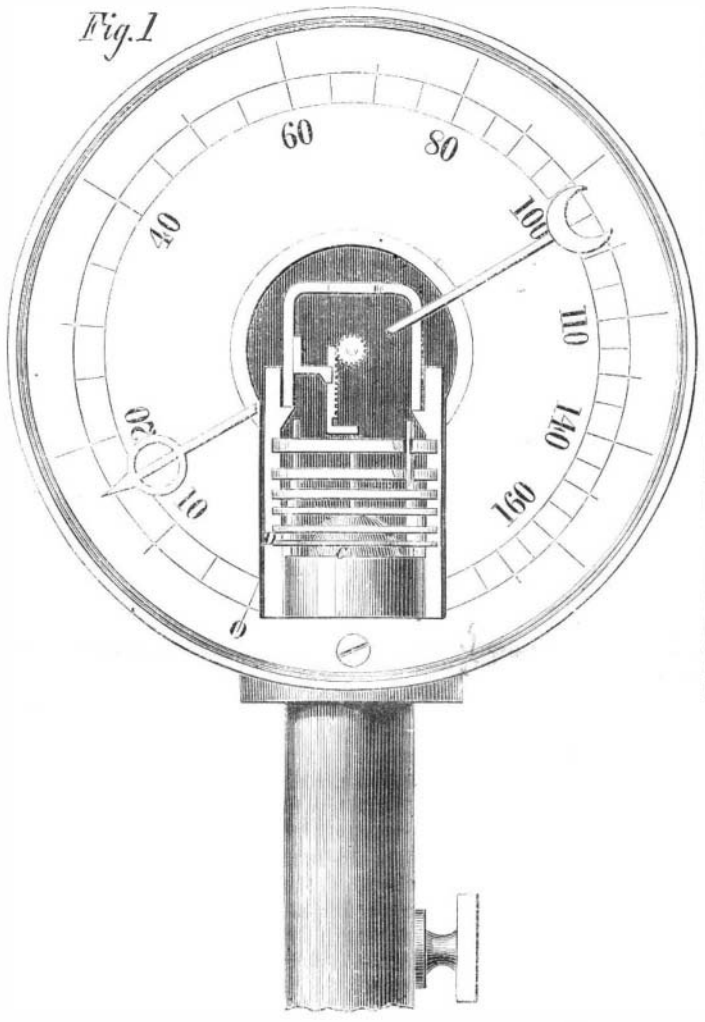
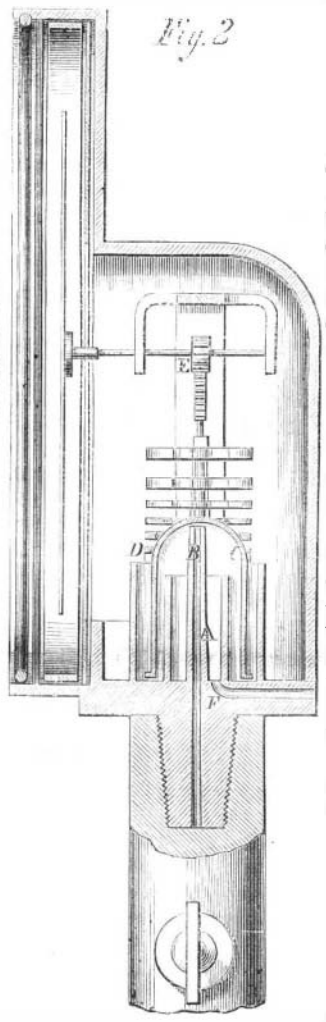
Improved Steam Gage.

The liability of ordinary steam gages, which work with springs, to get out of order, and, consequently, give incorrect results, led the inventor of this gage to construct one which should show the real pressure at all times, being controlled in its action by the same agent as the safety valve, namely, a weight.

In detail the gage consists of a central tube, A, which has a small hole, B, in it to admit steam to the interior of a receiver, C. The pressure comes on the inside of this and raises it. In rising it meets with an annular weight, D, which is placed at the top. This, of course, adds so much resistance to the further rise of the receiver, which is registered through a rack and pinion, E, on the face of the gage as usual. As the pressure increases the receiver continues to rise, and takes up other weights arranged above it, as clearly shown in the engraving; the additional pressure being, of course, registered as before.

In place of these weights the inventor proposes to use a series of cylinders disposed one within and over the other in an obvious manner; these would answer the same purpose, while the gage so made would have a much neater appearance. The central chamber, F, under the receiver, has a small hole at the bottom, which carries off the condensed water of the steam. This gage is claimed to be reliable under all circumstances. A patent is now pending on it through the Scientific American Patent Agency by Joshua Lowe, of Paterson, N. J., whom address for further information.





LOWE'S STEAM GAGE.

POWER REQUIRED TO START A TRAIN.

We had some discussion on this subject in Vol. XI., page 214. We extract this article from Zerah Colburn's new work on the locomotive:—

"The rail is the fulcrum upon which all the power of a locomotive is exerted; and all its motions, with reference to the train, or, in other words, to space, must be referred to this fulcrum. Many an engineman has perceived this from his own observation, and has argued from it that an engine must be able to start a heavier load when the cranks are up or above the axle, than when they are below it. Now, although this conclusion is wholly wrong, it is supported by a plausible induction; and so plausible is this, that some enginemen will have it that they *know* that they can get away better with a heavy load by starting with both cranks above the axle. They have, they say, a longer leverage, the rail being the fulcrum. The reason for this notion, although it is wholly fallacious, is worth examining.

Let us suppose an engine with two feet stroke of piston, and six feet driving wheels. The crank, from the center of the axle to the center of the wrist grasped by the connecting rod, is twelve inches long, and the radius, or half diameter of the wheel, is three feet Let us, for the sake of simplicity, suppose but a single piston, and that the total pressure of the steam upon it is 10,000 lbs. When the crank stands upright over the axle, and is being pulled over by the piston in the direction to take the engine forward, we then have 10,000 lbs. exerted at the end of a lever four feet long from the rail, the resistance to be overcome at the axle being at the end of a lever three feet long, and therefore 13,333 lbs. But this is not the force with which the engine is moved forward; for opposed to it is a force of 10,000 lbs. exerted against the back cylinder cover, and transmitted through the framing of the engine to the driving axle. So only 3,333 lbs, of effective pressure is exerted to take the engine forward. Let the crank next be down, or hang vertically beneath the axle. If it were pushed from the cylinder by a force applied externally to the engine just as we might, when standing upon the ground, push the wheel of a carriage with the hand, the engine would be rolled backward. But instead of the 10,000 lbs. pressure upon the piston being effective in this manner, it is exerted at the end of a lever two feet long from its fulcrum on the rail, while it is opposed by a force of 10,000 lbs., exerted in the opposite or forward direction, through the front cylinder cover, framing, and axle boxes, and acting at the end of a lever three feet long. The backward pressure exerted by the piston at two feet from the rail, produces a backward pressure of 6,667 lbs. at the axle, three feet from the rail; but this is overcome, with an excess of 3,333 lbs., by the pressure exerted upon the front cylinder cover and through the framing. So the forward pressure, effective for moving the engine as a whole, is 3,333 lbs. in either case—that is, whether the crank stand above or hang below the axle.

"The forces exerted through the cranks upon the driving axle may be perhaps better understood if we imagine the axle not to be closely embraced by its supports but to have a considerable 'slack' in its brasses, so as to permit of the direct movement of the axle, to a certain extent, independently of the pressure transmitted from the cylinder covers. Thus, with the crank down, and with an inch clear space between the surface of the axle bearing and its support toward the hind end of the engine, so that the axle could 'come and go' one inch without taking the engine with it, we should in the case already considered absolutely roll back the driving wheel, with a force at the axle of 6,667 lbs., and we should pull forward all that part of the engine over the axle with a force of 10,000 lbs. It would be only when the 'slack' between the axle and its support was taken up that the wheel would cease to roll back, and that the effective force, in a forward direction, would be 3,333 lbs. It must not be hastily supposed, from what has been said, that the total pressure of the axle against its support is, or can possibly be, greater or less than the pressure of the support against the axle. For in the above case we have computed a backward pressure of 6,667 lbs. of the axle against its support, and a forward pressure of apparently 10,000 lbs. through the same support against its axle. But, as the force exerted and the total resistance overcome must in all cases be equal to each other, an engine advancing with a force of 3,333 lbs. must be overcoming a resistance to that amount. This resistance may be represented by a weight of 3,333 lbs., hung over a pulley external to the engine, and attached by a chain to the back of the engine framing. So that, in the case when the crank is down, 3,333 lbs. of the 10,000 lbs. pressure upon the front cylinder cover will be directly expended upon the weight being lifted (or the train being drawn), and 6,667 lbs. only will be expended upon the opposite and equal resistance of the axle, which is being pushed backward by the steam acting through the piston rod and connecting rod. When the crank is above the axle, in the case supposed, the axle will be drawn forward with a force of 13,333 lbs., while the steam pressure upon the back cylinder cover, pushing the engine bodily backward over the axle, is 10,000 lbs. in addition to the weight