

# Scientific American

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

Vol. XIV.—No. 20.  
NEW SERIES.

NEW YORK, MAY 12, 1866.

\$3 PER ANNUM.  
IN ADVANCE.

## 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.

## 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 engine-man 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.

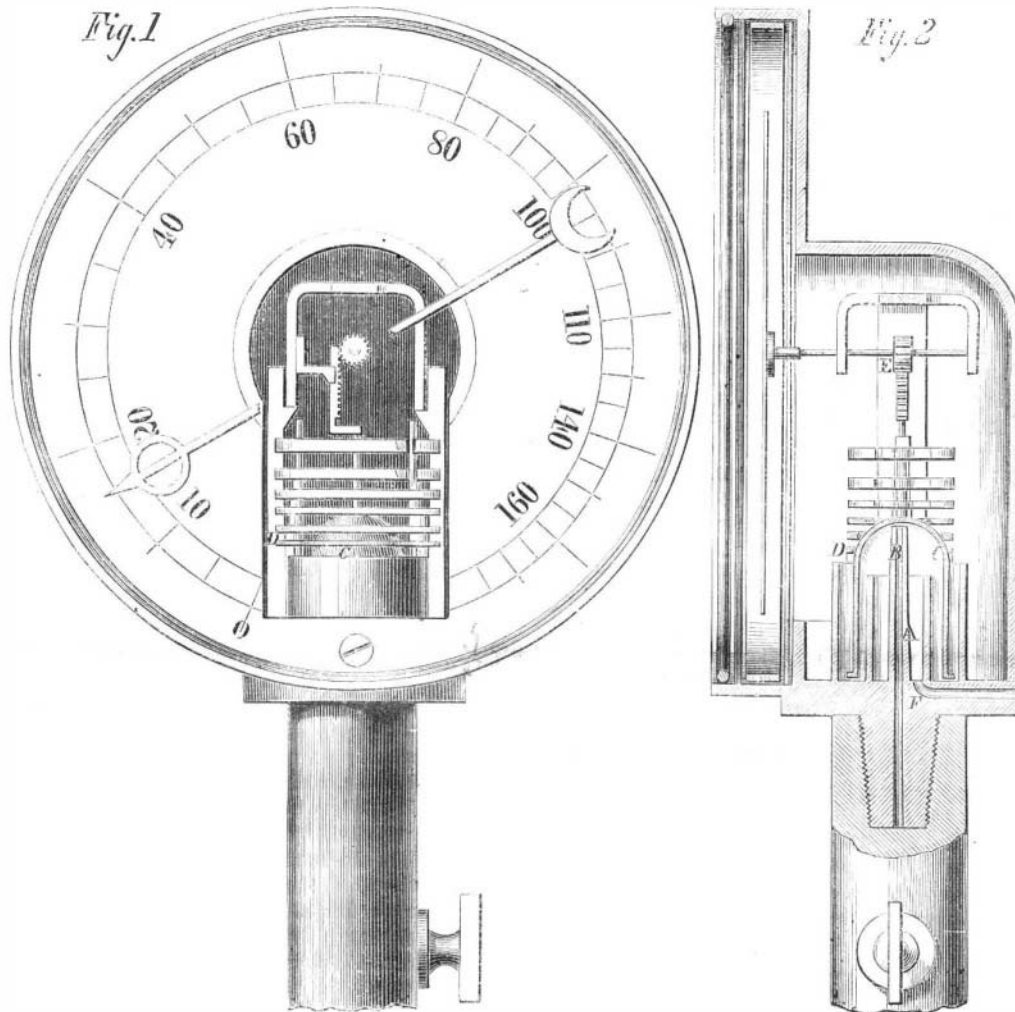
Let us suppose an engine with two feet stroke of

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

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



LOWE'S STEAM GAGE.

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

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

of 3,333 lbs. hung over the pulley, and which weight we have taken in this case to represent the resistance of the train. So in the case supposed we have a pressure in opposite directions between the axle and its hind support of 6,667 lbs. when the crank is down, and of 13,333 between the axle and its front support, or the front of the axle box, when the crank is up, the effective pressure applied to the train being 3,333 lbs. in both cases, as already shown. In this case, therefore, the wear on the front side of the axle box and on one side of the axle, will be twice as much as on the back of the axle box and on the opposite side of the axle. This great excess of pressure and consequent wear on the front of the axle box, in running forward, has led many to suppose, without due consideration, that the axle is always pressing forward in its box when the engine is going forward. There is, therefore, a somewhat plausible foundation for the notion occasionally entertained among engineers, that they can start a train with more ease when the cranks are up than when they are down. The pressure exerted by the steam directly against the axle is then greater, as we have seen; but the pressure on the axle, when the crank is down, is not only less, but it is in an exactly opposite direction; and were the wheels unconnected with the engine otherwise than by the connecting rods, they would be rolled backward instead of being pulled forward. But the pull of the engine at the draw iron is, as has been seen, the same when the crank is up as when down. Although we speak of the rail as the fulcrum upon which the forces exerted through the wheel are made effective, it will be understood that it is by the weight with which the wheels press upon the rails, and by their consequent friction, that a real fulcrum is obtained. As long as they do not slip, any motion in the wheels must carry the engine bodily forward, and it is necessary, therefore, that the friction of the wheels upon the rails be always at least equal to the greatest tractive force exerted by the engine. In the case which we have been considering, that of a single piston with 10,000 lbs. steam pressure, two feet stroke and six feet wheels, the greatest tractive effort is 3,333 lbs., and the friction of the wheels upon the rails must be at least equal to this. The constant tractive force is not, however, 3,333 lbs., as at the ends of its strokes the piston exerts no useful force whatever—the effect diminishing from mid stroke, where it is the greatest. The mean tractive force will, in this case, be 2,112 lbs.

#### TREATMENT OF CHOLERA.

It is the opinion of every physician who has had any experience in the management of this disease, that its preliminary or premonitory stages present opportunities for its almost certain cure, when the proper remedies are applied in time. It is well established that the disease commences in almost every instance with a *painless diarrhea*, which because of its painlessness, is apt to be disregarded or considered of no consequence, but when neglected runs rapidly into the more serious stage, accompanied with vomiting, cramps, feeble pulse and collapse. But if taken in its very outset, upon the first indication of diarrhea, the stage called *cholera*, then the administration of appropriate remedies is almost sure to be successful in arresting its further progress.

At a recent session of the New York Academy of Medicine, at which the subject of cholera, its causes, progress, and treatment, were under discussion, Dr. John H. Griscom presented an elaborate paper, in which, among other matters, he gave a translation of an essay from the proceedings of the Academy of Medicine, of Paris, written by Dr. Worms, Physician-in-Chief of the Military Hospital of Gros Caillou. Dr. Griscom, who has witnessed every epidemic of cholera in this city, and had large experience in its treatment both in private and public capacity, considers the principle upon which the recommendation of Dr. Worms is founded as correct, and the success which appears to have attended it to be based upon sound physiological and pathological reasoning.

We give the essay alluded to, translated for the SCIENTIFIC AMERICAN from a French journal by Dr. Griscom, who for 28 years has been one of the physicians of the New York Hospital.

“The study of the numerous cholera epidemics

which have visited Europe within the past 35 years has not been sterile; it has furnished science with matter of incontestable importance. One of its most precious gifts is the establishment upon a positive basis of its prophylaxis and its relation to public hygiene, in localizing the toxic element, its transmission by the matter of morbid dejections, and in signaling as the most decided auxiliary of this poison, the emanations of animal and vegetable substances in a state of putrefaction, the gases from privies and from stagnant waters. Another ascertained fact, and not less important, is that sudden and severe attacks of cholera, without premonitory indications, are of very rare exception, and that in a great majority of cases, a characteristic trouble of the digestive functions, and simultaneously of those of innervation and circulation, always precede for some time, and announce the invasion of the grave form of cholera.

“It is impossible not to admit that these prodromic or premonitory troubles (justly entitled choleric), are the effect of the slow and gradual action of the toxic agent, which has not yet found either in the local circumstances, or in the individual predisposition, sufficient elements for its full extension, or the display of its full power.

“It is this preliminary phase of the malady, wherein the vitality has been, so to speak, only grazed, that the stomach does not yet refuse to receive and to absorb medicaments, which offers to the curative art its true field for the development of its power, and it is especially concerning the treatment of this premonitory phase that I ask the Academy to permit me to expose briefly the results of my observations.

“The ordinary practice in these cases consists in prescribing repose, diet, the use of warm aromatic drinks, some diaphoretics, and in the last place bismuth or opium, either pure or in the form of Dover's powder; but when the epidemic influence has become very decided, the employment of these means is far from being followed by success, and the success, when it is obtained, has often little duration; I have so often seen choleric pass into cholera during the treatment by opiates, that in cholera times I cannot overcome the dread of opium.

“Beside, when this medication arrests the dejections, the stomach frequently remains embarrassed, and the patient feels no return of strength or appetite.

“On account of circumstances such as I have described, finding myself at the close of the epidemic of 1849 at the end of ordinary resources, I had recourse to a new and totally different medicine, which was mentioned in a letter addressed July 7th to the *Gazette Medicale*, of which letter I ask permission to reproduce a brief passage:— In the last of the month of June, when I was no longer charged with cholera service, it happened to me to receive on the 13th and 14th, seven men who had diarrhea, some of four and some of eight hours' duration. According to my habitual practice, I gave them an emetic (of two grammes of ipecac) and potions of two grammes of laudanum, also amylose and opiate lavements; but so far from seeing any amelioration follow this treatment, which had always succeeded with me in ordinary times, I must confess to an alarming aggravation; to the alvine dejections, which were frequent, vomiting was added; the evacuations assumed the choleric character; the voice began to grow feeble and to diminish; the pulse became almost imperceptible, and the characteristic alteration of the face left no doubt of the nature of the affection.

“This is one of those forms of cholera often met with among feeble subjects at the commencement or the end of epidemics. I immediately placed all these patients on the use of *mineral lemonade* (giving them a double dose of acid) and suppressed all other medicines. The effect was most striking; the very next day the countenances were ameliorated, the dejections were diminished, the skin became warm, and I found in place of a slender and almost imperceptible pulse, one well-developed and resistant, announcing a remarkable return of vitality. Three of these patients have left the hospital, and the other four eat from a half to three-quarters of their allowance.”

“This I wrote in July, 1849. Since that time in the visitation of cholera in 1853-'54, I have been enabled to apply to a much larger extent, in both the prodromic diarrhea and grave cholera, the method of

treatment of which, in 1849, I had made but an insufficient essay. Its success so far as choleric is concerned, has surpassed my expectations, the diarrhea, accompanied or not by vomitings, being arrested and cured with a promptitude altogether surprising. One may see, so to speak, the pulse rising, the skin becoming warm, the strength and appetite returning at the same time, and in a few days the patients finding themselves in a condition to return to duty.

“This result was so manifest that all the poor consumptives of my ward importuned for the same prescription of *mineral lemonade*, hoping from it the same efficacy for their colliquative diarrheas.

“Later still I have had occasion to prove the infallible fidelity of this simple means, and my most ardent wish is to see it in general use. I earnestly implore my honorable colleagues who hear me, not to regard me as influenced by an unreasonable enthusiasm, which would be wrong in a practitioner of my age; that they will suspend their judgment on the subject; the occasions for experimentation are not wanting at this moment, and I fear that they will become too numerous.

“Two, three, or at most four grammes [a gramme is about 15½ grains, troy measure] of sulphuric acid with a thousand grammes of water or a mucilaginous vehicle, with one hundred and fifty grammes of simple or raspberry sirup, makes a drink as agreeable and innocent as ordinary lemonade, and furnishes at the same time a medicine cheap, easy of preparation, and every where accessible.

“And when, as I have so often proved, my colleagues will have been able to convince themselves of the marvelous rapidity with which this lemonade arrests the evacuations, raises the pulse and the nervous system, warms the skin and gives to the patient the feeling of health, I doubt not that they will participate in the confidence with which its long usage has inspired me; as, moreover, these diarrheas are very evidently only an attenuated expression of the epidemic influence, they will naturally come to the conclusion that a medicament so powerful against choleric, should not be indifferent in confirmed cholera.

“To repeat here the mode of my practice, in cases of prodromic diarrhea, and according to the greater or less gravity of the case, I add three, four, or at most five grammes of concentrated sulphuric acid to a killogramme [a thousand grammes, equal to two pounds, eight ounces, one drachm and twenty four grains] of a sweetened decoction of saleg.

“The patient takes every hour a glassful of this lemonade, and rinses his mouth two or three times after drinking it; it is seldom that four glasses are required. I permit the simultaneous use of white wines, or of champagne, but I expressly proscribe the use of beer, brandy, and alkaline mineral waters during the epidemic.

“As to confirmed cholera, my practice is almost equally simple. The patient is kept in the most complete repose. Shampooing is practiced only during the pain of cramps. Every half hour a glass of the lemonade (of from five to ten grammes of acid to a litre) [a litre is a fraction over two pints] is administered, taking advantage of the moment immediately after vomiting. He takes beside, at discretion, wine and ice.

“I think it useful to remark that the lemonade, which has a great power to suspend the alvine evacuations, produces a contrary effect upon the vomiting, increasing its frequency and duration; but this prolongation is not unfavorable, and is generally an indication of a happy termination.”

#### Death of Mr. C. Wye Williams.

Men of science have been fast falling around us of late, and it is with regret we now add still another name to the list of those who have rested from their labors since the year began. Mr. Williams's name is too intimately connected with the principles of combustion, and his works are too well known, to need that we should point out seriatim all he has done. In fact, it is chiefly as an author that Mr. Williams is known, although he was a sound practical business man. He died on the 2nd inst, at his residence, the Nook, near Liverpool, in his eighty-seventh year. Mr. Williams was among the early mechanical improvers of mill work, having, in