DENTISTRY IN THE UNITED STATES.

NUMBER 3.

DENTAL FILLINGS.

Of the various materials used to fill cavities in teeth, the principal ones are gold, tin, amalgams, and cements. Of each of these there are different qualities and makes. Of gold foil filling there are three principal manufacturers, whose goods are so nearly alike that there is but little choice. The dentist prefers the softest metal. Many practitioners, not finding the foil sufficiently soft for their taste when purchased, anneal it over the flame of a spirit lamp before using it. When thus manipulated, it is more easily packed, can be condensed better, and the particles adhere to each other as though welded; thus making a filling almost as solid as if the metal had been melted, and poured into the cavity. Another kind of gold used for filling is the "crystal sponge gold," so called from its having the appearance of a crystalized sponge. This is used principally for "building up" teeth which have the crown destroyed. For a successful operation, this gold must be condensed by either automatic plugger or hand mallet process. Any attempt to condense it by hand pressure will fail, as the particles will "bridge," thus leaving the filling sufficiently porous to absorb the acids of the mouth, which would thus find their way to the walls of the cavity and continue their destruction. This metal can be condensed to a great degree of solidity. A patient who had the six central teeth built down with it (he had broken the natural ones) used the gold front teeth for cracking shell barks, in preference to the natural back ones; and they stood this rough usage for four years, and no doubt would have continued to do so longer, had the patient lived. Tin is a filling is used as in foil and in amalgams. As a foil, it requires as much manipulating as the gold, though it is not as durable; and the profit to the dentist not being in proportion to that on the use of gold, it is seldom used. A filling of tin foil will not retain its bright appearance and smooth surface, on account of the corroding action of the heat and acids of the mouth. Tin united with silver makes a good amalgam for temporary fillings. There is quite a number of different formulas for making amalgams, which are, as a general rule, composed of silver and tin. Some are of silver and cadmium, others of cadmium and tin. The metals are melted together, cast into an ingot, and made into fillings, which are sold to the dentist. Having prepared the cavity to be filled as for other fillings, he then mixes a small quantity of the fillings with sufficient quicksilver to make a thick paste, which he puts in a cloth, and by pressure squeezes out all the superfluous mercury. The silvery looking mass that remains in the cloth is plastered into the prepared cavity as quickly as possible, and in a few minutes sets sufficiently hard to receive a burnishing. This filling, when properly prepared and used, makes a good temporary filling; but unless done by an expert, it becomes a useless, crumbling mass. Though this is called a temporary filling, and is used as such by the profession generally, I know of two lower molar teeth still in use, that were filled with this amalgam fourteen years ago. The bone cements are usually nothing but chlorides, sulphates, and oxides of zinc. They are technically termed "*os artificiel*" or artificial bone, and are put into the cavity like mortar, with a spatula-shaped instrument instead of a trowel. In a short time, the material sets, and, as in the case of amalgams, if inserted by a competent person, it is a success. Otherwise it is a failure, as it will in that case shrink from the walls of the cavity, be acted upon by the secretions of the mouth, and sometimes wash out during the process of cleansing the teeth. There is but a trifling difference in the amount or quality of fillings used in the various sections; the gold being predominant, and the amalgams and cements standing side by side. There are about forty gold fillings to one plastic filling. One dental depot sold of gold foil in one year 957 ounces, which, at the usual rate of $36 per ounce, makes $34,452 paid for gold plugs by the dentist. As each ounce of this mass will average twenty-three fillings, and the cost of fillings averages six dollars, we find that the public paid for useful and ornamental repairs to the teeth (made with what was sold in one year, by one business house, of one single article) the sum of $132,066. About $1,000 was also paid for amalgam and cement fillings, according the usual proportion. Some practitioners utterly refuse to use anything but gold; and if the walls of a cavity will not sustain the pressure of inserting a gold filling, they will cut off the crown of the tooth, and set a pivot tooth, or build up with sponge gold. The plastic fillings are used principally by the lower classes, chiefly on account of the price; the proportionate rate of charges being $1 to $100 for gold, and from 25 cents to $5 for plastic fillings per cavity.

Correspondence.

Locomotives and Steam Cars.

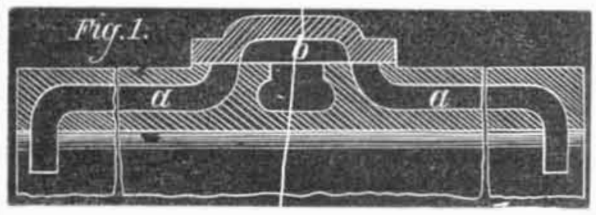
To the Editor of the Scientific American:

In your issue of August 22, it was stated, in an article under the head of "Steam Cars," that the locomotive ought to be more of a guide for builders of steam cars and other steam vehicles, on account of its low center of gravity, its excellent boiler, etc. The great problem, of course, is to so proportion and combine the various parts that the machine shall do the most work with the least possible repairs and fuel. To this end some of the following are essential:

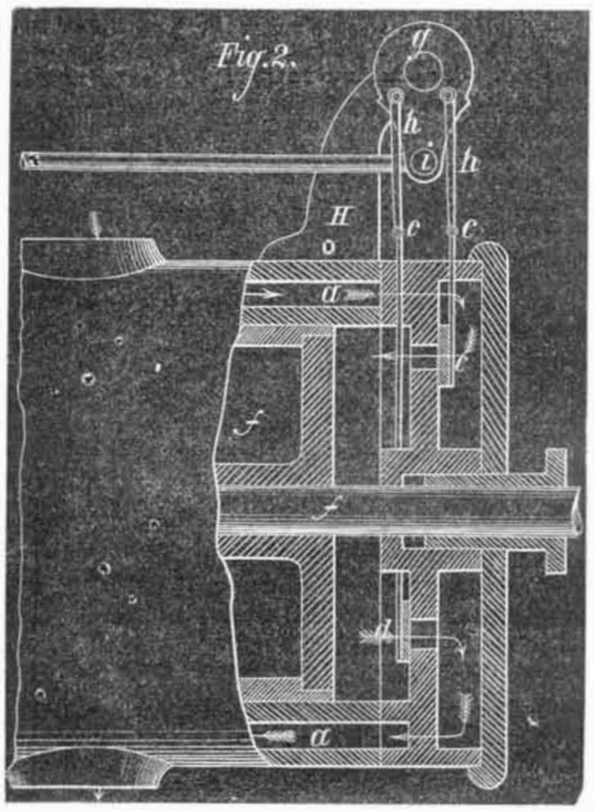
First, and most important, is a low center of gravity, as above stated.

Second: The connecting bar between the piston rod and crank should be as long as the machine will possibly admit—from eight times to ten times the length of crank, if possible—in order to reduce the pressure of the slides upon their guides, and hence their friction and wear, to a minimum.

Third: The length of the piston should equal half its diameter at least; if its length fully equalled its diameter, its durability and economy would be still greater. It should be cast in one piece, and made hollow or in cup form, to insure proper lightness. It should be fixed permanently to the piston rod before the last chip is turned off; then it should

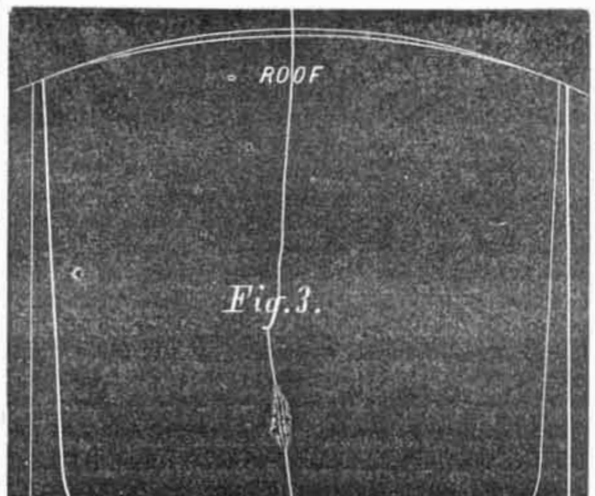


be fitted as snugly as possible to the bore of the cylinder, and yet it must work without chafing. A good practice is to surface such pistons with a shell of hard Babbitt or other composition not liable to chafe, and which may be easily renewed. If packing rings are used, they should be of the simplest possible make: two simple rings of steel or some other hard material, sufficiently elastic to admit, after being cut at one point, of being sprung into a single groove midway of the piston, the rings, of course, being placed so as to break joints. They may be held in position by a single dowel pin set in the piston beneath each ring. The loss occasioned by the escape of steam around a piston of the above description would be far less than the loss resulting from friction in attempting to keep a piston steamtight by set screws and springs (the old way), or by steam pressure.



Fourth: The bearing surface of the slides should be ample. A good rule is to make their combined upper and lower surface equal the piston area. For instance, a piston of seventeen inches diameter has an area of two hundred and twenty-seven square inches; one fourth of this is about fifty-six square inches for each of the four faces of the slides, as usually made.

Fifth: In the slide valves, considerable economy would doubtless result from a slight modification in the valve system. It now takes, to fill the passages, *a* (Fig. 1), between



the valve, *b*, and the ends of the cylinder, about five per cent of the steam used; if the valves were arranged as shown in Fig. 2. this five per cent of steam and fuel would, of course, be saved. (This illustration was drawn from a stationary engine in Worcester, which has this new system of valves.) It will be seen that there are two simple plate valves at each end of the cylinder, the inlet valve, *c*, and the discharge valve, *d*; *f* indicates the piston and its rod, the view being a central section at one end to show the arrangement; the valves, *c* and *d*, are driven by the rockers, *g*, which work in the top of two standards, H, the valve stems being jointed, at *c*, to the links, *h*. The arrangement is simple and perfectly applicable to the link motion of the present locomotive; it would only be necessary to connect the valve rod to the point, *i*, of one of the rockers, *g*. This arrangement would not only cause a direct saving of five per cent of the fuel now used, but would render the action of the steam upon the piston more direct and efficient; it would also reduce the steam pressure upon the back of the valves to less than half its present amount.

Sixth: Much better provision should be made for freeing the boiler from sediment; the narrow water space around the fire box and the bottom of the cylinder of the boiler under the tubes are liable to become so clogged with foul matter as not only to destroy much of the most valuable generating surface, but to cause irreparable damage to the boiler from excessive heat. One or two blow-off cocks are of very little use. Their influence extends but four or five inches either way from their openings; hence it would require at least 8 or 10 two inch cocks around the base of the fire box, and as many more in the cylinder of the boiler under the tubes to insure anything like a tolerable freedom from sediment; and even then, I think that in many localities sediment would still accumulate between the cocks. But as there are serious objections to numerous blow-off cocks, the only safety seems to be in screw plugs judiciously placed and used. Two plugs should be placed at each corner, even with the bottom of the water space around the fire box, so that a scraper may be passed entirely through from corner to corner, both laterally and fore-and-aft. A screw plug should also be placed exactly beneath the tubes in the cylinder of the boiler near the fire end, and another in the tube sheet under the tubes in the smoke chest. The most important item, in connection with this screw plug system, is to cause these plugs to be removed from three to six times a year, or as often as the nature of the water demands, and, by means of a scraper and a powerful jet of water, to thoroughly cleanse the boilers from sediment; this should be one of the most imperative duties of the men in charge.

Again, as you state, a low center of gravity is of the utmost importance in the make-up of a first class steam car, and this applies with equal force to all rolling stock. The narrower the gage of the track, the more imperative is the necessity of a low center of gravity. The reason is obvious: The lower the center of gravity of a car, the more steady will be its progress upon the track; and the less the lateral strain upon the rails and running gear, the less the liability of its leaving the track, and the less the liability of its overturning when it does leave the track. These facts are sufficiently trite and self-evident to need no comment.

Our present passenger and freight cars are susceptible of much improvement in this direction. The roof and the upper portion of the body might doubtless be reduced in weight one third and yet have ample strength for all that is required of this portion of the car, namely, protection of passengers and freight from the weather, and the safe passage of the brakeman from car to car on the roof. The running gear and the base of the body is none too strong or too heavy now, perhaps; but from the base timbers, the weight of the frame ought to diminish quite rapidly to the roof, not by offsets, but by gradual taper. The diagram (Fig. 3) presents this idea to the eye. Our car builders and intelligent railroad men recognize this idea, of course, but they do not carry it out perfectly in their practice. When this point shall be gained, an important economic result will have been attained.

If the body of a car could be dropped so as to bring the floor within two or three inches of the axles, this economic result would, of course, be still further enhanced; the wheels would not project through the floor sufficiently to interfere much with the seats or the loading of freight. A simple iron cap over each wheel would make all safe inside the car. This change would, of course, require some alteration in the truck frame and the housing of the wheel boxes; nevertheless it seems to be an alteration which is perfectly practical.

Any change in our present system which seems to indicate an important improvement in the stability, safety, and economy of our rolling stock is worthy the candid consideration of railroad men. F. G. WOODWARD.

Tides of Lakes and Lakelets.

To the Editor of the Scientific American:

It is said by most authors on tidal theories that there can be no tides on lakes, for the reason that the moon's attraction is equal over the whole surface of water. I hold that there is a tide raised from every body of water on earth. It is impossible for the moon to raise a body of water from the earth by its attraction, but it counterbalances or neutralizes a portion of the earth's attraction for the water, in consequence of which the water becomes lighter and the lower portion not so much compressed. Hence, on account of the elasticity of the compressed water, the diminution of compression is followed by an expansion which drives the superincumbent water upward. This is a natural principle which belongs to all bodies of water, although the effect is imperceptible if the water be shallow and not connected with very deep water.

By this theory (of my own) I account for the very considerable tide that rises on Eagle Lake in the northern part o this State. The lake is very deep and has never been fathomed. LA FAYETTE LILLARD.

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