

resistance, and adjusted until the deflection is the same as in the first case. The variable known resistance will then equal the unknown resistance. If the current is so great as to cause a deflection of the needle much exceeding 45° , it should be reduced either by removing some of the battery or by the introduction of extra resistance into the circuit. The same conditions must obtain throughout the measurement.—*Scientific American*.

VALUABLE INSTRUCTIONS FOR ENGINEERS.

The Eclipse Pump Manufacturing Co., Cincinnati, have published the following valuable instructions to engineers :

1. The first duty of an engineer, when he enters his boiler room in the morning, is to ascertain how many gauges of water there are in his boilers. Never unbank or replenish the fires until this is done. Accidents have occurred, and many boilers have been entirely ruined, from neglect of this precaution.

2. In case of low water, immediately cover the fire with ashes, or, if no ashes are at hand, use fresh coal. Do not turn on the feed under the circumstances, nor tamper with or open the safety valve. Let the steam outlets remain as they are.

3. In case of foaming, close the throttle and keep closed long enough to show true level of water. If that level is sufficiently high, feeding and blowing will usually suffice to correct the evil. In case of violent foaming, caused by dirty water, or change from salt to fresh, or vice versa, in addition to the action above stated, check draft and cover fires with fresh coal.

4. When leaks are discovered they should be repaired as soon as possible.

5. Blow down under a pressure not exceeding 20 pounds, at least once in two weeks—every Saturday night would be better. In case the feed becomes muddy, blow out six or eight inches every day. When surface blow cocks are used, they should be often opened for a few minutes at a time.

6. After blowing down, allow the boiler to become cool before filling again. Cold water pumped into hot boilers, is very injurious from sudden contraction.

7. Care should be taken that no water comes in contact with the exterior of the boiler, either from leaky joints or other causes.

8. In tubular boilers the hand-holes should be often opened, and all collections removed from over the fire. Also, when boilers are fed in front and blow off through the same pipe, the collection of mud or sediment in the rear end should be often removed.

9. Raise the safety valve cautiously and frequently, as they are liable to become fast in their seats and useless for the purpose intended.

10. Should the gauges at any time indicate the limit of pressure allowed by the inspector, see that the safety valves are blowing off. In case of difference notify the inspector.

11. Keep gauge cocks clear and in constant use. Glass gauges should not be relied on altogether.

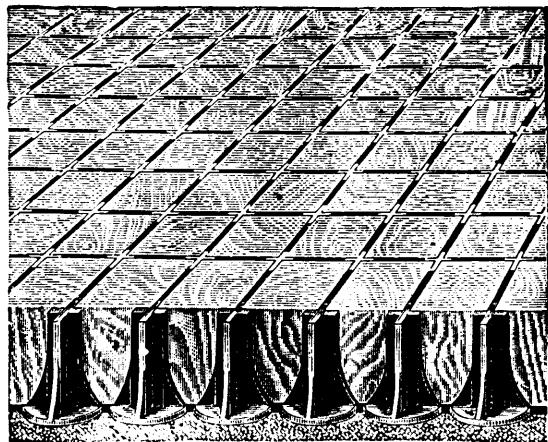
12. When a blister appears, there must be no delay in having it carefully examined and trimmed, or patched as the case may require.

13. Particular care should be taken to keep sheets and parts of boilers exposed to the fire perfectly clean, also all tubes, flues and connections well swept. This is particularly necessary where wood or soft coal is used as fuel.

14. Under all circumstances keep the gauges, cocks, etc., clean and in good order, and things generally in and about the engine and boiler room in a neat condition.

IRON PAVING IN SHEFFIELD.

There is now being tried at Sheffield an interesting experiment in the adaptation of iron for street-paving. A year and a half ago a small piece was laid down privately at the entrance to a manufactory. As that proved serviceable, the consent of the Sheffield Corporation was obtained for a trial of the system in one of the streets where it would be subject to the heaviest traffic in the town.



As shown in the accompanying engraving, the iron is used in the form of upright studs, each one having an independent base. The horizontal section of the stud is cruciform, the angles of which carry the corners of the four adjacent blocks of wood; thus each stud carries four blocks, and each block is carried by four studs. Upon a concrete foundation there is a thin layer of asphalt, upon which the studs bed themselves; these being slightly taper, the wood blocks are wedged slightly in, the interstices of which being filled with pitch, the whole is firmly bound together. The ends of the studs projecting slightly above the wood, not only carry the weight of vehicular traffic, but give a foothold to horses which is lacking in ordinary wood-paving, and dispenses with the usual gravel sprinkling. The experimental piece was laid down in Saville-street about two months ago. The work was done by Mr. G. Carr, contractor, of Carlisle-street, and consists of thirty-eight superficial yards.—*Building News*.

A COUNTRY BOY'S HOME-MADE MICROSCOPE.

The cut shows an effective form of microscope for beginner's use, and one that every boy can make who has a good spy-glass or telescope. The eye-piece, or joint nearest the eye, contains (in every good glass) four lenses arranged in two



groups, and serves directly as a compound microscope to enlarge the image which the object glass, or front lens, forms.

If this joint be unscrewed and held steadily at the proper distance from an object, it will serve as an ordinary microscope and of a very fair power. This may be accomplished in a simple manner, as follows : Take a nice piece of pine, about