ENGINE POUNDING—WAYS OF STOPPING IT.

An engineer in charge of a smoothly running engine shows it with pride; but if, on the other hand, his engine *pounds*, he is humiliated and feels like apologizing for the disorder, when, perhaps, it has pestered him from the start. That monotonous thud is always in his ears. He goes to the crank, and it is there; and when at the cylinder, it is there. It can only be silenced by making the boxes so tight that they become heated. The remedy is worse than the disease; so they are slackened again, the pounding goes on, and at times becomes almost unbearable. It is known that such imperfections are caused either by poor work in the shop or by imperfect alignment, and sometimes both; in which case the trouble may be regarded as chronic, and an overhauling in the shop is required. The work involved in dismantling and lining up is such as to discourage this undertaking. There are tests which do not require much time or labor and serve well to detect imperfect alignment, as well as bad workmanship, and will show up imperfections that a line will not. A description of these may be of interest to some. The accuracy of the results will largely depend on the proper fitting of the connecting rod and correct boring of the boxes.

In Fig. 1 is shown a simple device for proving this work. A square block of wood is turned at one end to fit the wrist pin boxes. The other end is made to fit the crosshead, as shown at A. The square shoulders are to rest against these boxes. A strip of wood, B, is made to reach the point, C, when bolted to the block as shown. The point at C is brought within the thickness of paper of the side of the rod. The block is then withdrawn and introduced into the opposite side of box, care being taken not to derange the strip, B. When the block is thrust to its shoulder, the point, C', should be the same distance from the rod as at C, provided the flanges of box, O, are of equal thickness. Allowance must be made at C C' for any difference that may exist, as, for instance, if the point at C should stand off an eighth of an inch and the box flange at O be found as much thicker on this side, the boring of box, O, is evidently correct. The same process is employed to test the box, E. It will be seen that any deviation from a true right angle in the boring of these will be increased at the point, C, in the ratio that the width of box bears to the length of rod. Assuming the rod to be correct, it is connected with the crosshead and keyed some tighter than when in use. The engine being horizontal, the crank end of rod is brought to center of the main shaft and raised to the wrist pin at the upper half stroke. It should here be in position to go on the wrist without forcing laterally in either direction, and the same when lowered to the lower half-stroke position. If it should bear off in one direction above and in the other below, it is evident that either the shaft or crosshead wrist is not level. This correction may be made without reference to a level, judgment dictating where the change can best be made. If the wrist box should require forcing toward the main shaft, both above and below, it is plain the wrist of crosshead is not square with the slides, or the hub of crank is too short. A subsequent test will indicate which is wrong. The rod may now be supported in a horizontal position, and the crosshead with rod attached moved from one extreme of slides to the other, noting if the wrist boxes bear the same relation to the wrist of crank at the two dead centers. Any discrepancy here will indicate that the main shaft is not square, or not at a right angle with the slides. By adjustment of the shaft and repeated trials, a good degree of accuracy may be secured in this way; but care must be taken to see that the rod has no lateral movement.

The next and last test is to disconnect the rod from the crosshead and connect it to the wrist pin, keying so as to prevent lateral movement and yet allow the wrist pin to turn. Support the rod above the crosshead so it may be free to move horizontally. Revolve the crank slowly, at the same time keeping the crosshead wrist exactly under the rod box. If all is right, the box should be in position to freely drop on the wrist at any point. This verifies the accuracy of the previous test. But if continually on the crank side of crosshead, and requiring about the same amount of forcing to bring it to the wrist pin that it did at the other end in the former example, it is evident the hub of crank is too short, or in other words, the center of wrist in crank is too near the main shaft, and the wrist in crosshead is not out of square, as the former test might indicate. Should the end of rod vibrate from side to side as it moves from end to end of slides, it shows one of two things—either the shaft is not squarely placed, or the wrist pin in crank has been improperly set, thus causing the rod to wobble. This latter defect is a serious one, and invariably causes pounding if it exists to any considerable degree. It may be a matter of surprise to those making such tests, to find how seldom the machinist reaches perfection in such work.

The above methods are doubtless open to criticism, but at the same time they possess merit in being able to detect defects that cannot be reached with a line or level.

W. A. L. KIRK.

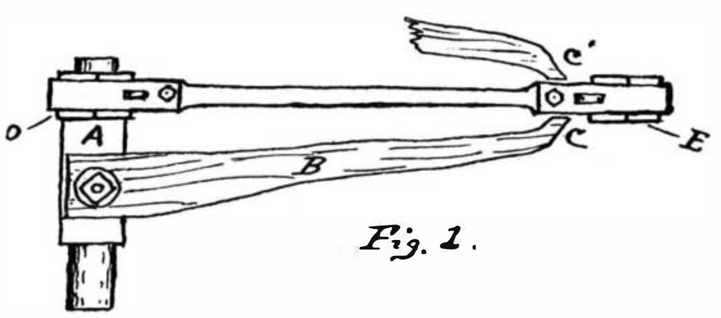

Fig. 1.

Photographing upon Wood.

The Magazinist, *The Century*, *Harper's* and other popular monthlies use "process" engravings more and more. Photography on wood is their mainstay, and has almost superseded the draughtsman on wood. A sketch, say a dozen times as large as the proposed engraving, is made, reduced by photography, and then put upon the wood.

Photographing on wood by the wet plate process is done thus: A slight modification of the collodion transfer will no doubt meet all requirements. First make a reversed collodion transparency in the camera from the negative. A tough and horny collodion should be used. Develop with—

Pyrogallic acid....	100 grains.
Citric acid	60 "
Acetic acid....	2 ounces.
Water....	20 "

and fix in hyposulphite of soda. Coat the wood with the following hot solution of gelatine:

Gelatine....	4 ounces.
Water....	1 pint.

Dissolve the gelatine by placing in a vessel of warm water, and then add 4 grains of chrome alum and mix thoroughly. The wood, having been coated, is allowed to dry. The gelatine surface is then moistened with water for ten or fifteen minutes, and the transparency, still wet from the washing water, is laid down upon it and pressed lightly in contact, and allowed to dry under slight pressure. When dry, the collodion readily leaves the glass, and remains in contact with the block.

Here are some further points: The plate is cleaned as usual, and dusted with powdered talc and polished off. It is then coated with positive collodion, sensitized, and exposed as usual, fixed with cyanide of potassium, and placed in a dish of warm water. In the meantime, have your block blackened by rubbing drop black on it, or ordinary blacking, and coat and drain well with a solution of the commonest glue you can get, 1 ounce to 12 ounces of hot water. The common glues are the best, for they take a much longer time to set than better ones, and so you can get a much thinner coat with draining. Place your block in a vessel of water, having it immersed about three inches, then bring your photo. from the dish, place it over the block, and under the water. You will find by touching the edges of the film it will readily leave the glass. You can then turn it about any way under the water, and when in position raise your block gently out of the water, bringing the film with it; if it is puckered at all, it is owing to raising too roughly, and must be placed in the water again. If satisfactory, place at an angle to drain, and dry in warm, airy place. The whole operation, from focusing to getting the block ready for drying, will not take a practiced hand more than twenty minutes. The common glue will not block the tool at all if you drain the block well, and when cut all can be removed immediately with a sponge and warm water. I may add that a very good way to black the block is to hold it over a petroleum lamp with its chimney removed. The glue water will not come off it if applied in the same manner as applying varnish to a negative, and under no circumstances be induced to use a black varnish, for it is next to impossible to do a good job, for the graver slips as if it were cutting on glass.—*Wilson's Photographic Magazine.*

Lamp Accidents.

Some people have the notion that any coal oil lamp is safe, provided the best quality of oil is used. A very large proportion of our population must use kerosene lamps, and they must have cheap oil. It is among such people that lamp accidents are most common, and many a life is lost. Happily, humanity has little regard for station when life is concerned, and the government department of explosives exists for eminently humane reasons; hence the institution of an inquiry by Sir F. Abel and Mr. Boverton Redwood on the subject of accidents with mineral oil lamps, which has just been concluded, and upon which Colonel Majendie has submitted a report to the Home Secretary. This does not altogether substantiate the theory that cheap oil is to have all the blame.

The investigation is a continuation of one which the same chemists made in 1885, and which resulted in a number of suggestions that have benefited the public not a little. All lamp accidents are not due to explosions in the lamp; but those which are, comprise the largest number, and it was as to the cause of these that Sir F. Abel and Mr. Redwood directed their attention. Their experiments have resulted in the enumeration of several causes, which we give briefly:

1. Rapidly carrying or moving a lamp, so as to agitate the oil, causes a mixture of vapor and air to make its escape from the lamp in close proximity to the flame, and, by becoming ignited, determines the explosion of the mixture existing in the reservoir.

2. Existence of an imperfectly closed filling aperture in the lamp reservoir favors explosion, owing to a vapor and air mixture being formed.

3. A sudden cooling of the lamp, owing to exposure to a draught, may give rise to an inrush of air, whereby the air space in the reservoir is charged with a highly explosive mixture, and the flame of the lamp may at the same time be forced into the air space. Blowing down the chimney to extinguish the lamp has the same effect; and if the wick be lowered very much, or the flame is otherwise much reduced in size, the lamp may become much heated, and its susceptibility to the effects described will be increased. Explosion in these cases is favored by the air passages being obstructed by dirt or charred wick; by the wick not being long enough to reach the bottom of the oil reservoir, and if the lamp is allowed to burn until the surface of the oil is scarcely level with the end of the wick.

4. The accidental dropping of the burning wick into the oil reservoir is a fruitful source of explosions.

5. If the flashing point of the oil used be just near the legal minimum, vapor is given off comparatively freely, but the mixture of vapor and air in the reservoir will probably be feebly explosive in consequence of the presence of an excess of the vapor; but if the flashing point of the oil be comparatively high, the vapor will be less readily or copiously produced, and the vaporous mixture be more violently explosive. The effects are more violent if the quantity of oil in the lamp is small, and oil of high flashing point is more likely to cause heating of the lamp than one of low flashing point, in consequence of the higher temperature developed by the former and of the greater difficulty with which some oils of that description are conveyed to the flame by the wick. It therefore follows that safety in the use of mineral oil lamps is not to be secured simply by the employment of oils of high flashing point.

Sir F. Abel and Mr. Redwood state that a loosely plaited wick of long staple cotton draws up the oil freely and regularly, and is altogether better and safer than a tightly plaited wick, and their experiments lead them to the conclusion that a lamp explosion is not usually sufficiently violent to cause the fracture of an ordinary glass reservoir, although in several recorded cases it has had this effect. They give a table of particulars of the cases of accident which they have investigated, and a long statement of the principles of construction which should be adopted to prevent accidents.

Crocodile Nests and Eggs.

Some habits of crocodiles have been lately described by M. Voeltzkow. Traveling in Wituland, he obtained in January last 79 new-laid eggs of the animal, from a nest which was five or six paces from the bank of the Wagogona, a tributary of the Ooi. The spot had been cleared of plants in a circle of about six paces diameter, apparently by the crocodile having wheeled round several times. Here and there a few branches had been laid, but there was no nest building proper. The so-called nest lay almost quite open to the sun (only a couple of poor bushes at one part). The eggs lay in four pits, dug in the hard, dry ground, about two feet obliquely down. Including eggs broken in digging out, the total seems to have been 85 to 90. According to the natives, the crocodile, having selected and prepared a spot, makes a pit in it that day, and lays about 20 to 25 eggs in it, which it covers with earth. Next day it makes a second pit, and so on. From the commencement it remains in the nest, and it sleeps there till the hatching of the young, which appear in about two months, when the heavy rain period sets in. The egg laying occurs only once in the year, about the end of January or beginning of February. The animal which M. Voeltzkow disturbed, and saw drop into the water, seemed to be the *Crocodilus vulgaris*, so common in East Africa.

The Fastest Boat in the World.

The torpedo boat Adler, constructed in Germany for the Russian Black Sea fleet, is described by the Russian papers as the fastest war vessel afloat, having attained during its trial trip a speed of 26·55 knots. The boat is 150 feet long and 17 feet broad, with a displacement of 150 tons. Three gunboats, one of which—the Narghen—is finished, are being constructed in German shipyards for the Baltic fleet, and these will be almost as fast steamers as the Adler.