Now the action of the whole apparatus will be clear. When the engine begins to pull, or when the tug approaches a bend, it will bring in slack rope; but as soon as the slackness is felt behind the clip-drum the piston of the slack gear cylinder will be able and will begin to turn the chain drums, pushing thereby the moving sheaves further out and maintaining practically the original tightness of the back rope, but causing a greater quantity of it to be carried between the moving sheaves. If on the other side the back rope becomes tighter it will at once cause the moving sheaves to slide towards the clip-drum, pushing the pistons in the slack gear cylinder back against the steam pressure. This will cause some additional rope to be paid out, by which again the normal tightness of the rope is maintained. Whether both, or only one, and which of the two sheaves acts, is immaterial. Two are required, partly to get as much a length as possible, for storing up slack rope, partly for securing the possibility of working the tug back wards as well as forward without turning as will be seen presently. If the engine would be reversed the pul ing strain exerted by the clip-drum would be brought to bear on the moving sheaves, and would make them slide back towar ls the clip-drum, whilst an immense amount of slack would appear behind it which would be sure to produce a serious accident The slack gear therefore has always to be stopped before reversing the engine, and this is done by the catch falling into the teeth of the chain drum as above described. To avoid all possibility of accidents the reversing lever itself is connected with the catches, so that the motion of the chain drums, and thereby of the moving sheaves, is certain to be stop ed when reversing the engine. The tug then acts like any other tug without a reversing gear, which of course is perfectly admissible for short occasional movements backwards.

When, however, the tug has to start on its regular return journey, the position of the rope is altered in the following way: The half-coil round the clip drum is t ken out and slipped into the empty bottom centre sheave just below it, the half coil in the top centre sheave is taken out and slipped into the groove of the clip-drum. Nothing more is wanted. In following now the rope from the other end of the boat in its passage through the pulleys, it will be seen that it again first passes clip-drum, and that the slack gear sheaves follow afterwards. The tug, therefore, returns with the slack gear in full and correct op ration. With a number of tugs of this description the traffic of a canal should be worked along one rope in the following manner:—Each tug runs backwards and forwards between certain stations, or travels on so long till it meets another tug. Both tugs then turn about after exchanging the trains of canal boats they were bringing along, and again proceed till they meet their neighbours. This is undoubtedly the most convenient and economical method of working the wire-rope system on canals. On rivers towing is generally only of importance for boats going up stream. Here wire-rope tugs will best run the whole journey, returning generally empty as they do on the Rhine, and used to do on the Meuse, and leaving the rope altogether for the back journey. For such boats only one moving sheave is required, and the whole arrangement becomes considerably simpler. At the same time, the incidental and various advantages of the slack gear, offering the possibility of constructing boats of very shallow draught, giving to the boat almost perfect liberty to steer, and avoiding kinks and similar difficulties with the rope, are of the greatest importance for shallow river navigation, and will doubtless extend the application of wire-rope towing under circumstances where, up to now, it frequently has been considered unsuitable.

Rose-colored Stain for Wood.—Monnier recommends steeping the wood for several hours in a bath of 1,200 grains iodide of potassium to the quart of water, and then immersing it in a bath of 375 grains corrosive sublimate, when it will assume a beautiful rose-red color by chemical precipitation It should subsequently be covered with a glossy varnish. The baths will not need renewal for a long time.

Experiments with a single-track elevated railway have been made in Philadelphia, and pronounced successful by a number of railroad officials present.

HAYWARD TYLER AND CO'S IMPROVED UNIVERSAL PUMP.

At the exhibition held recently at Bedford, Eng., the new patent valve gear fitted to this pump attracted considerable attention. An illustration of this modification will be found in another page. It will be remarked that the improvement relates to a method of working the piston at each end of the stroke, so that if from any cause the pump should fail to take its water no accident can happen. The cushioning arrangement consists of a modification of the exhaust passage in the steam piston, it being made double, as shown in woodcut, one portion of it being almost closed just before the termination of the stroke Thus the piston shuts in a small amount of steam sufficient to check the momentum of the piston before the reversal of the slide. When the slide has moved the piston is cushioned, as is usual with live steam The amount of cushion by exhaust steam is so regulated that when the pump is doing ordinary work there is no back pressure, but as soon as the work is taken off with steam full on, the great amount of steam suddenly relieved of work cannot be discharged, and the engine chokes itself.

I saw one engine exhibited tested myself, with the following results:—Steam in boiler, 40 lb; pressure on pump, 60 lb., pump running at about 64 double strokes; 8½in. steam cylinder; 6in. piston. The suction hose being then suddenly lifted out of the water, the pump went off at a slightly increased speed, the beat being of a different nature, being a series of long choking sighs. When, however, the suction pipe was again put into the water the engine recovered herself and the beat was as clean a cut-off as could be desired, not a trace of throwing could be heard. The woodcut represents the original and the improved steam piston Also a 12in. cylinder and 12in. pump. The importance of this invention is not in its application for general pumping purposes in factories, &c., where the work is regular and constant, but for situations where the work may suddenly vary owing to the source of supply being pumped dry, or some accident happening to the rising main. Mining engineers will well understand what we mean, but there are many situations besides coal mines where the tank, pump, or caisson, as the case may be, is apt to be suddenly exhausted, and an ordinary steam pump or a steam engine without an efficient governor will run away. In the ordinary steam engine this is prevented by the governor, but in this invention the object is gained without increasing the number of working parts of the steam pump.—*Engineering.*

TORPEDO EXPERIMENTS.

THE FIRST "OBERON" EXPERIMENT

At Stokes Bay, on Thursday, Aug. 6th, took place, under the direction of the special committee of which Sir W. Jervois is president, the first of a series of experiments whose importance as bearing on the question of the defence of our harbours and roadsteads can hardly be over-estimated. The Oberon, as most of our readers are aware, has been long in preparation for a course of attack by submarine mines, to be carried on until it terminates in her destruction, the object being to test the effect of such mines under various circumstances on the bottoms of our men-of-war as at present constructed, and so to learn exactly how to place our charges to the best advantage, as well as to ascertain what constitutes a bar which ships cannot cross without being destroyed.

To carry this out the Oberon has been provided with sides and bottom corresponding exactly to those of H.M.S. Hercules, and also with a condenser taken from her Majesty's ship Octavia. The system on which she is attacked, we need hardly say, is to begin with comparatively distant charges, and gradually to approach nearer to the vessel, carefully investigating the effect in each case, so as to obtain the maximum amount of information that can be afforded by so costly an experiment. It has been decided by the Torpedo and Obstruction Committee to adopt the charge of 500lb. of compressed gun-cotton, as what we may call the normal one for the conditions most commonly occurring. It happens that the depth best suited to give full effect to this charge is about 8 fathoms of water, and this is about the depth most commonly found in the passages to be defended. Five hundred pounds of gun-cotton, it is to be borne in mind, correspond to two thousand pounds of powder.