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CONSTRUCTION OF THE YARROW WATER TUBE BOILER.

We have been favored by Mr. Yarrow, of torpedo boat fame, with photographs and a description, showing his new system of expanding boiler tubes by steam, and other improvements in the boilers themselves. The tube expander which is here shown in operation in the shops at Poplar, London, was designed to replace the old apparatus, which was worked by hand. The introduction of the steam-driven tool has resulted in a great saving of time and cost over the old system. The expander, which is small and compact, is suspended at the desired height, and is driven either by a motor or, as shown in our engraving, by a cord from the overhead shafting, operating through a length of flexible shafting. The taper mandrel within the body of the expander is revolved by the action of the rollers, the body being driven by the miter gear, which can be seen in the cut. By giving the rollers a slight inclination they are made self-feeding, and over-expanding is guarded against by providing a stop. In the accompanying illustration three of the Yarrow boilers are shown turned up on end for the purpose of expanding the tubes where they enter the water pocket.

Mr. Yarrow states that the impression that it is a difficult matter to retube his style of boiler, on account of the tubes being straight, is erroneous, as may be seen from the accompanying cut, which shows a section through one of the boilers. If it is desired to insert a tube, say in the center of the tube plate, it is only necessary to pass it far enough through the upper or lower plate to clear the opposite plate, passing the tube from the hole in one plate to the next hole in other plate and repeating the movement until the desired position is reached. Thus the upper end of the tube is first passed through hole, A, in the drum; it is then slid down until the lower end enters hole, B, in the water pocket and the upper end is clear of A. This end is then passed up into C, and the lower end drawn out of B and placed in D. By continuing this movement the tube can be carried through a line of holes to its place. The same method is adopted in removing a faulty tube, though, of course, all the tubes in its way have to be also removed. The lower tube end is expanded, in the case of repairs, by sending a boy into the water pocket for the purpose. When this cannot be done, a long mandrel is passed through the tube and operated from above.

The accompanying section of the upper drum of a Yarrow boiler shows the new system of automatic feed. All makers and users of water tube boilers are aware of the value of any system that will automatically regulate the feed. These boilers contain very little water at any one time and the fierce ebullition causes great and rapid fluctuations of water level.

Yarrow & Company are endeavoring to overcome the difficulties of constant feed by providing an automatic device within the drum of the body, and by providing each boiler with its own independent donkey pump. It is claimed that only in this way can the obstruction of a breakdown in any one boiler be localized. In any group of boilers which have a common source of feed supply the bursting of a tube in one of the boilers will call for an extra supply of water that will be greater in all probability than the capacity of the pump. As a consequence the water level will be lowered, not merely in that particular boiler, but in the whole set. This would be a dangerous predicament and might easily result in serious injury to the complete plant.

These considerations are especially strong when applied to the water tube boiler, where the internal pressure in the tube would cause a specially large escape of

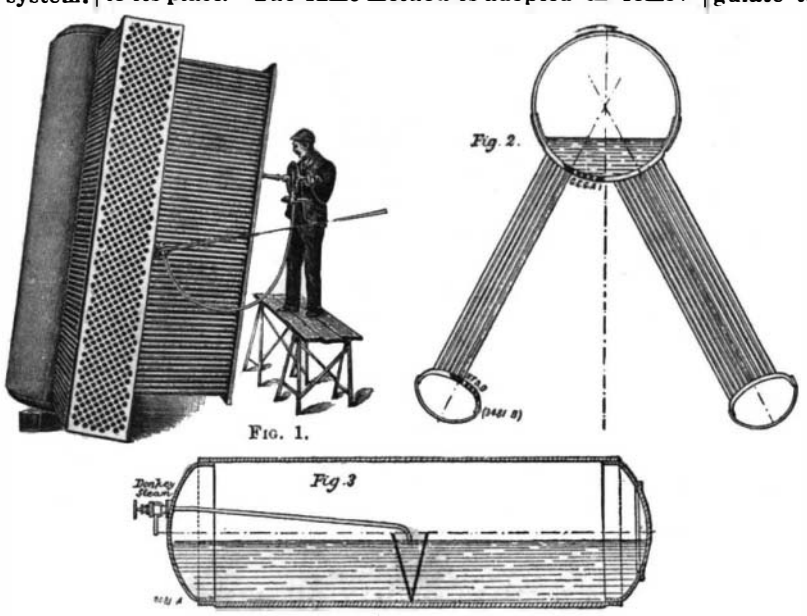
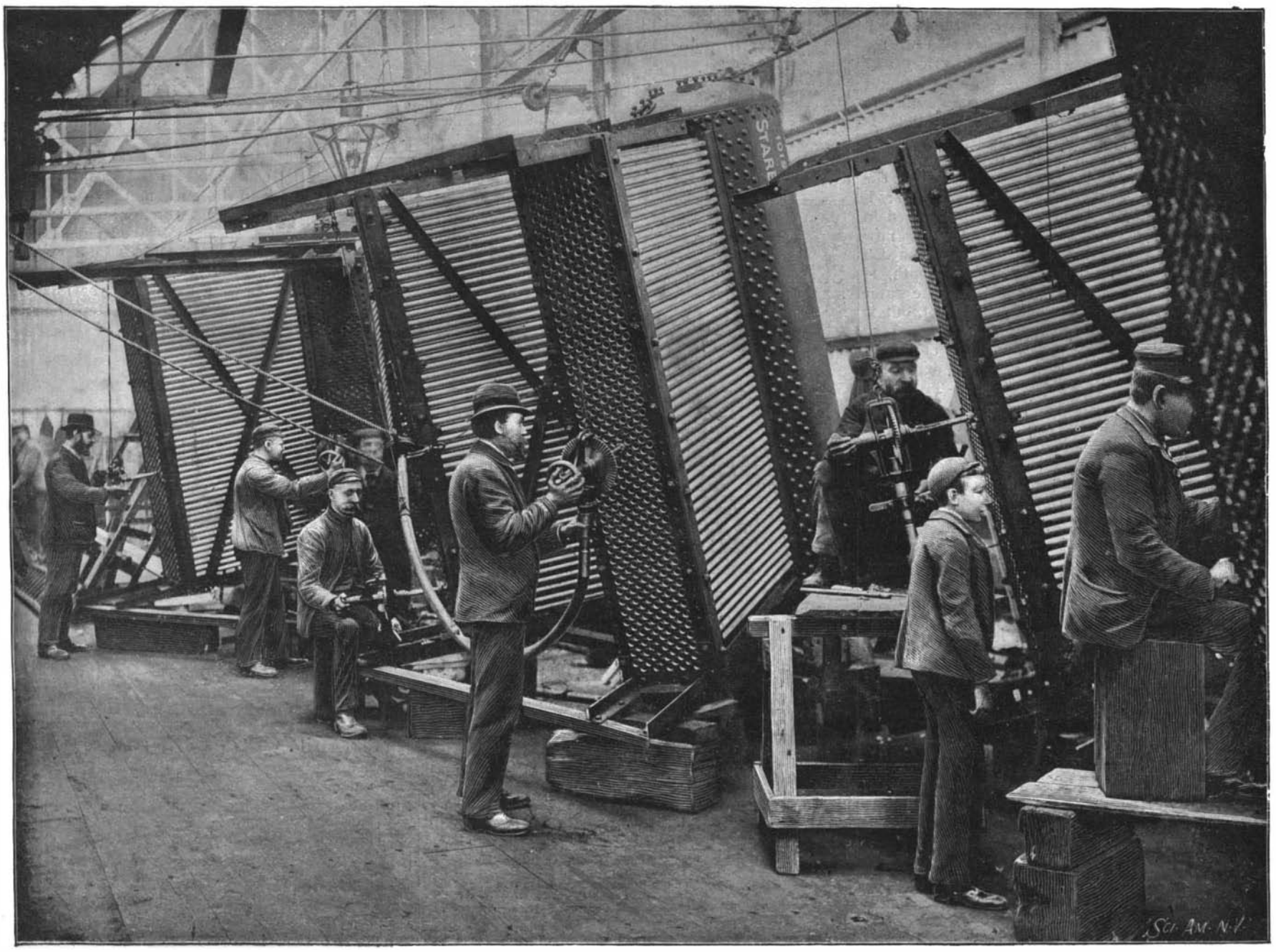


FIG. 1.

DIAGRAMS SHOWING METHOD OF RETUBING AND AUTOMATIC FEED OF THE YARROW BOILER.



EXPANDING BOILER TUBES IN THE YARROW & COMPANY'S MACHINE SHOPS.

water in the event of its rupture, as compared with the tubes in the common form of boiler, where the pressure is external.

Another advantage to be secured by using separate feed is that it favors the use of a very simple and reliable device for securing automatic feed. It is self evident that any so-called automatic feed must be absolutely reliable, for the reason that the knowledge that such a feed has been fitted to a boiler will cause the stokers to pay less attention to the water level.

The device shown in the cut has proved very successful on a boat fitted with engines of 300 horse power; though it remains to be seen how it would work on a large scale. About the center of the steam drum is arranged an inverted funnel, which is perforated so as to insure that the water level within it shall be the same as the general level in the drum. The funnel serves to prevent any violent ebullition of the water within it and maintains it at a steady level. Above the water in the funnel and near its surface is fixed the steam supply pipe for the donkey pump. So long as the water is below the pipe the donkey will supply the boiler; but when it reaches the pipe, water, in place of steam, will pass to the pump and actuate the steam piston. Now, since the steam piston is larger than the pump piston, it follows that, as long as water flows through the steam pipe, the boiler will be relieved of water, and this will go on until the level falls again. It is thus evident that a double advantage is secured by this system—the boiler is pumped up if the water is too low and it is relieved if it be too high, both actions being automatic.

The Pool of Siloam.

The excavations which are being made in Jerusalem have disclosed much that was hitherto unknown about the pool of Siloam. The identification of the site of this pool is important, because of its bearing on the situation of the city walls. It has hitherto been considered that the pool of Siloam, shown to every visitor of Jerusalem, was one of the few undisputed localities in the topography of the sacred city. Now, however, as investigation progresses, doubts have been raised on this point. Among archæologists a contest has arisen as complicated as that concerning the site of Calvary, the sepulcher, and other sacred places in Jerusalem. The pool of Siloam is in size the least of all the Jerusalem pools, which from the most ancient times have been relied upon by the inhabitants to store up water from the springs. It had, however, the singular characteristic of suddenly increasing in depth as the water poured in from some unknown source.

The pool of Siloam, although small in size, played an important part in the sacred history of Jerusalem. It was to Siloam that the Levite was sent with the golden pitcher on the "last and great day of the feast" of tabernacles; it was from Siloam that he brought the water which was then poured over the sacrifice in memory of the water from the rock of Rephidim. It was to this Siloam water that the Lord pointed when he stood in the temple and cried, "If any man thirst, let him come unto me and drink." The Lord sent the blind man to wash at the pool of Siloam, the sacredness and efficacy of whose waters are still believed in at Jerusalem. The pool of Siloam, which has now been almost wholly uncovered and which is the one formerly shown to visitors, is 18½ feet in depth, 14 feet wide at one end and 17 at the other. The water in it is maintained at a depth of 3 to 4 feet, but is likely to rise a foot or more at any moment. It is faced with a wall of stone, now greatly out of repair. Several columns stand out of the side walls extending from the top downward into the cistern. The water passes out of the pool through a channel cut in the rock, which is covered for a short distance. This subsequently opens and discloses a lively, copious stream which empties into a garden planted with fig trees. Jerome, who lived only six miles from the pool of Siloam, refers to the intermittent character of its waters, which has led some historians to identify it with Bethesda. Josephus speaks of its waters as having been very abundant, but recent investigations do not bear this out.

There are a large number of somewhat similar pools in Jerusalem, which has thirty or forty natural springs within a radius of eight miles. If it could be shown that one of these was in reality the pool of Siloam, whose location has not hitherto been questioned, it would add a still further confusing element to the discussion of the historical sites in Jerusalem. Many of the most important places depend for their identification upon their nearness to or remoteness from the pool of Siloam. The mysterious ebb and flow of the waters of the present pool has been largely relied upon as sufficiently proving its identity with that referred to in the Scriptures. It has now, however, been found that a similar phenomenon takes place in the Fountain of the Virgin, which is close by. There the water rose a foot in five minutes, and within five minutes more it sank to its former level. It is believed that the excavations which are being made in Jerusalem may explain this apparent mystery, which nobody has yet been able to account for.—Public Opinion.

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(Illustrated articles are marked with an asterisk.)

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OUR SEMI-CENTENNIAL ESSAY COMPETITION.

We would draw the attention of competitors for the $250 premium, offered for the best essay on the "Progress of Invention During the Past Fifty Years," to the fact that the date limit set for the reception of manuscript is drawing very near. There is a danger of the essayist underestimating the time which will be necessary for him to do justice to so comprehensive a subject. Although the paper will be comparatively short, covering about two and a half columns of the SCIENTIFIC AMERICAN, it is liable to involve an amount of previous reading and general reference which will cover more time than the intending writer may estimate. For this reason, and in order that the judges may have ample time to examine manuscript which will be submitted to them, we trust that intending competitors will not defer the transmission of their essays until the last allowable date.

We also direct attention to the card which is appearing in our current issues, by means of which we are endeavoring to obtain an expression of opinion on the part of our readers as to what invention introduced during the last fifty years has conferred the greatest benefit upon mankind. The answers that have already come in indicate that opinion will be far from unanimous; and the value and interest of the vote will depend largely upon the number who favor us with a reply. We hope that the majority of our readers will find the matter of sufficient interest to send a card expressing their views.

PATENT SOLICITORS AND THE PROPOSED PATENT BAR.

Such relations as those of lawyer to client or of physician to patient have always been recognized as sacred. In the professions also so much depends upon the competency as well as honor of the practitioners that the law very properly takes cognizance thereof, and requires proof of standing and of competency before any person is allowed to practice in the professional role. In the lawyer's care are placed the rights of his client to property, to freedom or to life itself. He very justly is subject to rigid investigation before being admitted to the bar and is required to serve a clerk's apprenticeship before practicing independently. A similar condition obtains in the case of the physician. He must possess definite and statutory qualifications before he is allowed to practice his profession and take upon himself the dispensing of remedies against the ills of mankind. His adjunct the apothecary is subject to similar requirements. Exhaustive examinations, practical and theoretical, have to be passed before the pharmacist can legally put up a single prescription. He is obliged to understand the qualities of all drugs; to watch every prescription for the detection of possible error in it. If an error has crept in involving danger to the patient, he is to note it, and guard against it, and must act as a constant check upon the physician, thereby giving additional protection to the patient.

There is another case where relations just as sacred and confidential exist as between members of the above professions and those whom they serve. We refer to the relations of patent solicitor and his client.

The services of a specially trained patent solicitor are essential, and the inventor has to enter into intimate and confidential relations with him—relations precisely comparable to those of lawyer and client. His secret work is all disclosed. The steps of his invention are discussed; he tells what led to it, what was his first conception, in order to enable the fundamental idea to permeate specification and claims. It would be hard to find a more confidential relationship than that of inventor and his patent attorney. Honor is the first essential in the practitioner's character. The papers are prepared, the solicitor, under his power of attorney, is given carte blanche to prosecute, and fees are paid. Competency is now required to properly conduct the work.

Within the past two or three years the country has been flooded with pamphlets, tracts and circulars from patent solicitors whose irregular practices are widely known in the profession. To warn the widely scattered class of inventors against such offenders is a slow, unsatisfactory, and impracticable process. The inventor is left to be enlightened only at the hands of that hard master bitter experience.

These irregulars are often possessed of capital and by extensive advertising are able to lure the unsuspecting into their clutches, and in some cases these "gentlemen" have a quite extensive practice before the Patent Office. Their business methods are widely known and are thoroughly understood in the Patent Office, whose officials would gladly embrace any opportunity to disbar such attorneys from practice, were not the provisions of the law for attaining this end so very circumscribed that it is practically impossible to procure the evidence necessary to convict.

The remedy for these evils is suggested in the annual report of the United States Commissioner of Patents. He proposes the establishment of a patent bar analogous to the bar of courts of regular procedure, but a bar whose members should be solicitors of patents. There