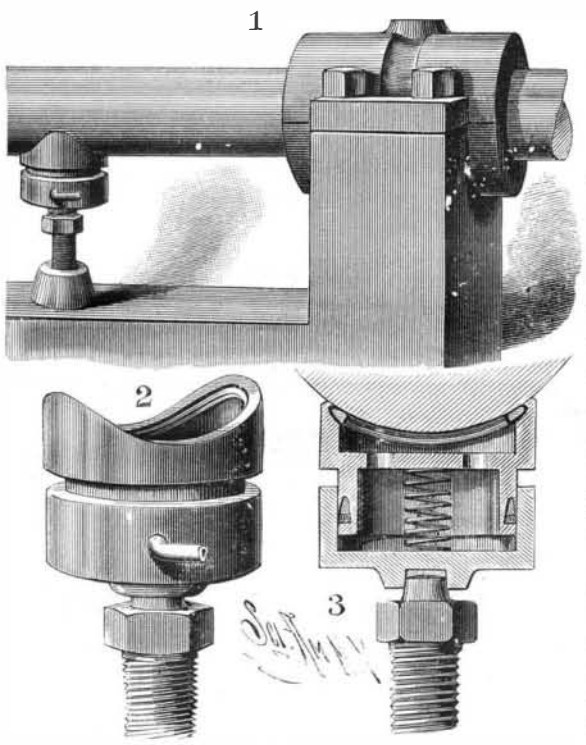
SUPPORTING AND END THRUST ANTI-FRICTION PADS FOR SHAFTS.

The accompanying engravings show an improved supporting pad designed to counteract the effect of the weight and friction of steamship shafts upon their bearings, also the friction on the journals of iron and steel rolling mills, and on all heavy bearings of whatever nature, and also a pad designed to counteract the end thrust of propeller shafts. Both of these devices have been patented, by Mr. Valentine H. Hallock, of Queens, N. Y., in the United States and principal countries of Europe.

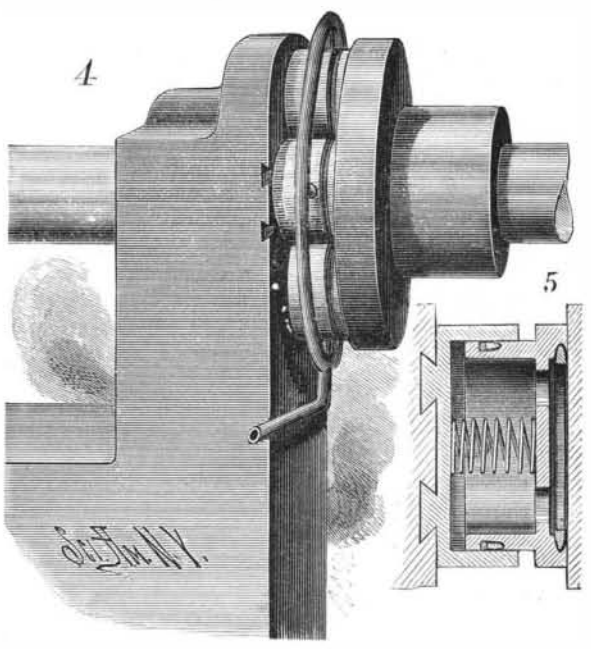


SUPPORTING PAD FOR SHAFTS.

In order to relieve the bearings or journal boxes of the effect of the weight of the shaft, a supporting pad, consisting of two cylinders, one bored out to receive the other, as shown in Fig. 3, is applied to the shaft between the pillow blocks. In the circumference of the upper cylinder is a recess into which is placed leather packing held by a ring. When the pad is charged with water under pressure, the outer section of the packing is forced against the inner surface of the under cylinder, and leakage at that point is prevented. The head of the upper cylinder is provided with holes and with a recess, and its face is concave to fit the surface of the shaft. Leakage between the pad and the shaft is prevented by a leather packing similar to the one already described. The spring shown in the cut serves to keep the head in contact with the shaft when the pad is not charged with water. By means of the screw upon which the pad rests, the latter can be removed from the shaft or can be pressed up against the shaft. The pad is supplied with water by a force pump connected by a pipe with the supply opening of the pad, as shown in Figs. 1 and 2. The pump is furnished with an air chamber and with a safety valve set at the maximum pressure required in the pad; when the pressure reaches the desired limit, the water blows off through the valve. The air in the chamber forms an elastic cushion, whereby the pressure in the pad is rendered yielding to some extent, and the friction between the pad and shaft is reduced to a minimum. The use of this pad materially reduces the wear of the journal boxes, since they are relieved of the pressure usually produced by the weight of the shaft.

When designed to counteract the end thrust—as represented in the second engraving—several pads are secured on the face of the pillow block, and bear against a flange fastened on the shaft. In the cut four pads are shown, but the number may be decreased or increased, according to circumstances. The pads are formed with dovetailed ribs (Fig. 5), which engage with corresponding grooves in the face of the pillow block. The pads are formed of cylinders, one within the other, packed with leather held in place by rings like those above described. Between the outer face of the head of the cylinder and the flange is packing, which prevents leakage at that point. The spring keeps the head in contact with the flange when the pad is not charged with water. The pads are supplied with water by a force pump provided with an air chamber, acting as an elastic cushion, and with a safety valve set to discharge when the maximum pressure is reached. These pads, which may be applied to counteract the end thrust of the shaft in either direction, are reliable in operation, and their use will insure the saving of a large percentage of power. The arrangement of the pipes supplying the pads with water is clearly shown in Fig. 4.

It is claimed that the use of these inventions will result in a saving of both time and power in ocean navigation, and will afford great advantages in overcoming friction in tools used in the manufacture of iron and steel.

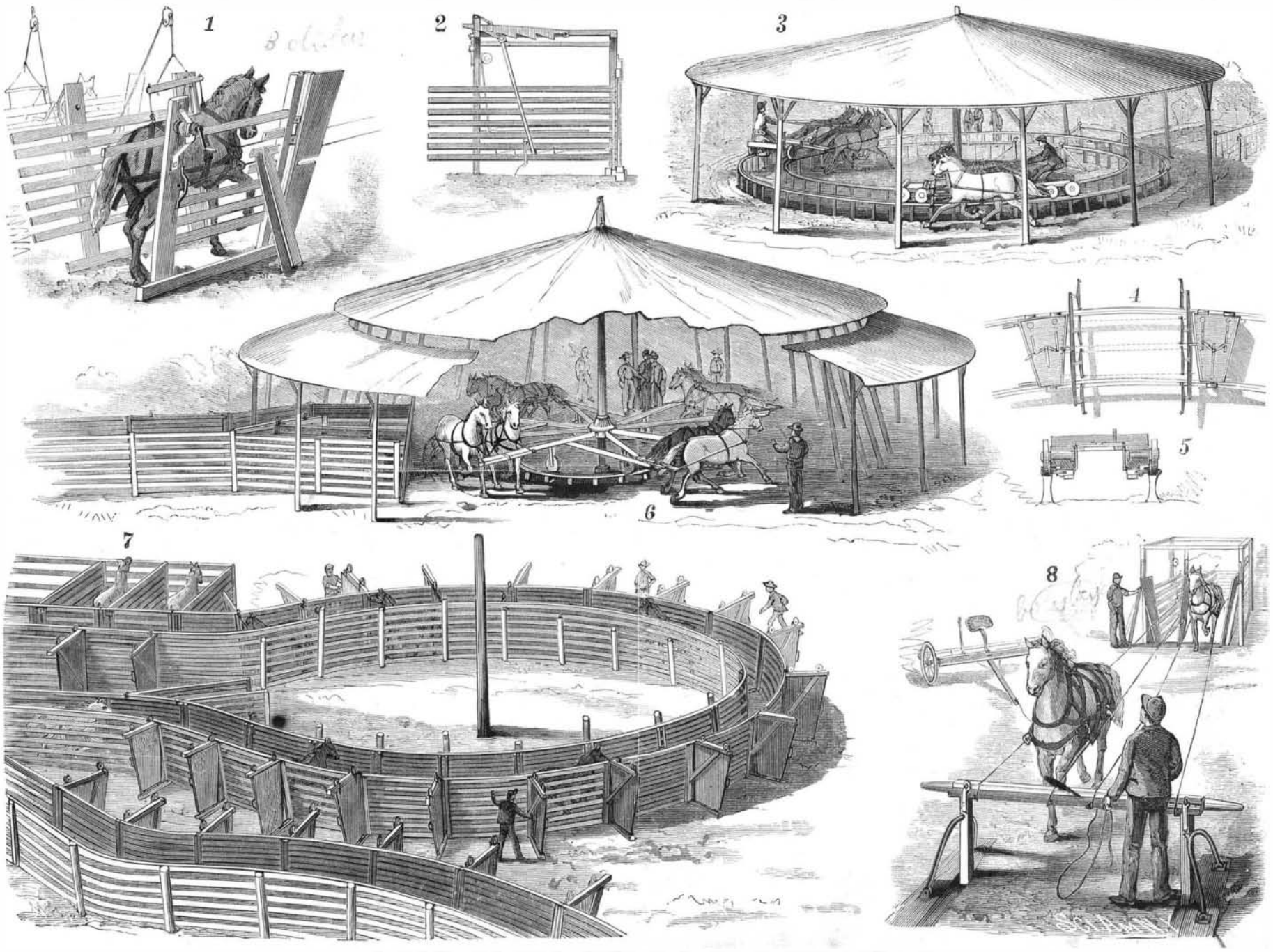


END THRUST PAD FOR SHAFTS.

IMPROVED APPARATUS FOR TRAINING HORSES.

The accompanying engravings represent several appliances so designed as to cover every step in the breaking and training of horses. The apparatus possesses many excellent qualities; it does away entirely with the cruel practice, at present too common, of first lassoing the unbroken horse, then throwing it, and frequently choking and beating until the spirit of the horse is almost broken. The theory embodied in this system is, that kindness and firmness will subdue any animal, and in constructing this apparatus these two points were prominently and constantly before the inventor.

The harness, shown in Figs. 1 and 8, has side pieces or plates for conveniently attaching the horse to sliding pieces placed upon supporting ropes, and is so constructed that it will keep its place upon, and support the weight of the horse, no matter what position he assumes—whether he kicks, plunges, or



SHEDD'S IMPROVED APPARATUS FOR TRAINING HORSES.

throws himself. The supporting bar is suspended over the stall in which the horse is to be harnessed, by a rope passed over a pulley held above the stall. By drawing downward or letting away upon the rope the harness may be raised from or lowered upon the horse, thus avoiding the necessity of entering the stall. The general arrangement of the harness is shown clearly in the cuts. Each side plate is provided with an eye to which the sliding pieces on the leading ropes may be attached by snaps, so that, the leading ropes being held taut, the horse can be led along the ropes, which, together with the harness, will hold him from rearing and kicking, and will support him in case he should throw himself. To prevent the horse from throwing his weight upon the supporting ropes, the forward belly-band is formed with one or more points so arranged as to prick the horse and compel him to stand up if he should put his weight upon the belly-band; of course, the points are normally held away from the horse.

The rear ends of the supporting ropes are fastened to a shaft in the stall, and provided with pawl and ratchet attachments, which prevent the shaft from turning back when the ropes are wound upon it. The outer ends of the ropes are secured to a neck yoke placed upon posts (Fig. 8) hinged in recesses made in the floor. The posts are held in a vertical position by curved bails hinged to the floor; when tipped back, the bails enter curved recesses cut in the floor. When down, the posts and bails lie flush with or below the floor. The head doors of the stall being closed and locked, the horses are run into the stalls, and the rear door closed behind them. After having been harnessed, the head doors are opened and the horses led along the supporting ropes to the neck yoke, to which they are attached alongside of two well trained horses. The vehicle is now drawn forward by a central rope, and the tongue placed in the ring of the neck yoke. The horses are then attached to the whiffletrees of the vehicle, and the supporting ropes are detached from the winding shaft and attached to cleats of the vehicle. The neck yoke is disconnected from the posts, which, together with the bails, are turned down, when the four-horse team is started. It will be seen that the wild horses, being harnessed, are so held that they can neither injure themselves nor the persons handling them.

The stall walls used with the sweep (Fig. 6) slant upward and outward, to prevent the horse from turning and yet give him a comfortable place to stand; and the rear end of the stall is closed by a vertically sliding door held in place by cleats, while the forward end of the stall is closed by hinged doors held closed by cross bars. The ropes from the drums pass through slots made in the forward doors. When the horse is to be harnessed to one of the four arms of the sweep, the stall is connected with a chute through which he is run into the stall.

The sweep revolves about a center post supporting the center of the inclosure, and is composed of radial arms lapped past the post and bolted, and of sweep arms attached to the radial arms. The rear sweep arm of each pair is provided with a sliding bar carrying two whiffletrees, while each forward sweep arm has a bar to which the neck yokes are attached. Wheels running upon a circular track keep the sweep arms true and strengthen the sweep so that it will sustain the weight of a horse, should he attempt to throw himself. While the horse is being hitched, the sweep is locked in place. The supporting ropes pass from the stall to the arms of the sweep. The horse is first run from the chute into the stall and harnessed, and attached to the leading ropes by breast, breeching, and belly straps attached to the sliding pieces, which, in this case, are made of leather. The sweep is then locked, the bar carrying the whiffletrees is shoved back, and the ropes are attached to one of the sweep arms and drawn taut by turning the winding drum by means of the crank. The forward stall doors are then opened, and the horse is run out between the ropes to the sweep arm, when the free ends of ropes secured to the arms are passed through one of the three holes in the sliding pieces and attached to the inner whiffletree of the sliding bar, which has been shoved out. The leading ropes are then detached from the sweep. The horse being thus hitched to the sweep, a well broken horse is brought alongside of him, and attached to the outer whiffletree and neck yoke, when the braces are disconnected and the horses started together, turning the sweep. The sweep, having four arms, is adapted for training four horses at a time. The same methods may be applied to breaking saddle horses, by changing the harness slightly, and saddling the horse for the rider while attached to the sweep.

The stalls used with the apparatus shown in Fig. 8 are preferably constructed in pairs, so that two horses or cattle can be handled at the same time. The rear door is shown in Fig. 2. It is so made that it can be moved backward or forward in the stall, so that after the animal has been placed in the stall he can be shoved forward by the door and held from backing. Simple devices are provided for holding the door in any desired position. The front door is held closed by an upper and lower cross piece, so connected with a lever that they can be moved both to and from each other simultaneously and at both ends equally, so as to lock and release the doors at both the upper and lower ends at the same time. When cattle are to be handled, the head doors, instead of being slotted, have large openings made in them, through which the oxen can be forced, by the rear door, to put their heads, so that a double yoke may be placed upon them. In handling oxen neither the outer neck yoke (Fig. 8) nor the vehicle will be used, it being designed, when double stalls are used, to yoke two wild cattle with two well-broken oxen, and break them in any manner desirable.

Fig. 7 represents a structure (the roof of the inclosure being removed) for handling vicious animals to tame and train them. A common pen, leading from a large yard in which the untamed animals are herded, is connected by a gate with a smaller alley, into which the animals are run singly. The animals are directed, as desired, through chutes leading to different yards or pens. By making the stalls in connecting series, adapted to be separated by sliding gates, many animals may be handled at the same time; and by opening all the gates they can be conducted from the entrance to the box stalls, shown in the upper part of the figure; or by closing any of the gates in front and rear of the animal, he can be stopped and confined at any desired part of the circuit or series of stalls. When the animals are wild and dangerous, they are kept in the stalls and treated kindly until, by degrees, they become gentle and tame; and in order that they may be reached and kept from injuring themselves, the sides of the stalls are made slanting upward and outward. By preference, the stalls are made two feet wide at the bottom, four feet wide at the top, six feet high, and eight feet long, thus furnishing a comfortable space for the animal, and yet preventing him from turning in the stall.

Fig. 3 is a perspective view of a circular driveway, upon which the vehicles, shown in section in Fig. 5, run; Fig. 4 is a plan view of a portion of the track. Each vehicle is provided with a doubletree having four singletrees, two of the latter being within the driveway and one on each side. The driveway is composed of rails held upon posts a short distance above the ground. The rails are so formed that the vehicles can be locked upon them by sliding arms provided at their lower outer ends with anti-friction wheels. These sliding arms may be conveniently moved outward or inward, for locking or unlocking the vehicle from the rails; the arms can all be moved simultaneously. Each vehicle has a triangular platform, provided with two outer and one inner wheel. The vehicles are joined together in pairs, so that the wild horses between them will be held in a partial inclosure, formed by short leading ropes, to keep the horses from rearing upon or leaping over the track. At one side of the track is a gate for the entrance of the horses. Harnessing stalls and leading ropes, similar to those described above, are here employed. An underground passage beneath the track permits trained horses that work on the inside of the circle to pass in and out. The unbroken horses are attached to the vehicles, and a well trained horse hitched, one inside and one outside of the circle, alongside of the wild horses. A sufficient number of horses to fill the circular track may be trained at once; the vehicles are all coupled together, and when the horses are started, all travel together around the track. The wild horses are trained in this manner until thoroughly broken.

These inventions have been patented by Mr. Charles F. Shedd, of Fairfield, Clay County, Neb., who will furnish all further particulars.

To Grow Plants from Cuttings.

The old way of rooting cuttings in a small glass bottle filled with water is a good method when a hotbed cannot be used; but the bottle should not stand so close to the window as to become hot, and thus scald the rootlets. A little cotton wool within the rim of the bottle will prevent evaporation. In two or three weeks the roots will be plentiful, and then the cuttings may be transferred to thumb pots, or, if the season suits, into the beds. As each cutting is taken from the bottle, dip the roots into a little warm sand until each fiber is coated; this will keep them apart and prevent wilting. If pots are used, nearly fill them with a rich sandy compost, and press it to the sides, so as to leave room in the center. Put the roots in gently, and give the plant a little twist to spread the roots, or separate them with a hairpin. Then put in more soil, and press it about the roots. Tight pressing is one of the secrets of success in raising plants from cuttings. Water the young plants well, and shade them at first from the sun.

Cuttings can be also started in pots of sandy compost, with a glass tumbler placed over them to confine the moisture, and keep from the sun for two or three days; then place the pots in the warmest window exposed to the southeast. Wet sand is also good for growing cuttings, and they will start quicker than in compost. A shallow pan is preferable; fill it up with sand (not sea sand) sopping wet, then press in the cuttings tightly, and keep them wet. When new leaves show themselves, in two or three days transplant into pots filled with light sandy loam. After shading a day or two, they may have ample sunshine and sufficient water to keep them moist. Cuttings taken from the fresh growth of a plant strike best. It is better to break off a branch of a geranium or verbena than to cut it (if it breaks readily). Cuttings of roses, heliotrope, etc., will grow better if taken off at the junction of the old and new wood, and should be cut off just below a joint or bud, as the roots start from that point; and if a bud is not left near or close to the base, the cutting is liable to decay in the soil.

The New English Torpedo Boats.

A large sea-going torpedo boat, the first of the series of forty which the country owes to the recent popular agitation on "The State of the Navy," was lately tried in the Thames. The vessel has been built by Messrs. Yarrow & Co., of Poplar, being one of twenty that the Government has ordered of that firm. The trial was, according to present regulations, for two hours' continuous steaming at full speed, and during that time, and as nearly as possible in the middle of the two hours, six runs were made on the measured mile. A mean speed of 19¼ knots was realized, 19 knots being the guaranteed speed, with an air pressure in the stokehold of only 1¾ inches as shown by the air gauge. The boat is 125 feet long, 13 feet wide, and 8 feet deep. She has naturally far more accommodation than the first class torpedo boats hitherto constructed, being able to berth well a crew of twelve or thirteen men forward, while there is comfortable room for the officers aft. Special care has been taken to provide efficient ventilation in the new boats, and it is hoped that the great discomfort hitherto found when at sea for any lengthened period will be materially reduced. There is one tube forward for ejecting torpedoes right ahead, and arrangements are made for firing four torpedoes from either side, or two from one side and two from the other, at the option of the officer in charge. The number of torpedoes carried will be five, one in the bow gun and four in four guns for side firing. It will thus be seen that there are five torpedoes all ready to be discharged at a moment's notice. This is considered a far better arrangement than hampering the boat with a number of spare torpedoes, of which none will be carried. There will also be two machine guns, one being placed on the top of each conning tower. There are two conning towers, one forward and the other aft. Provision is made for steering the vessel from either of these towers, so that should one get damaged in action the other will be available. The four-side firing torpedo guns are fixed two to each conning tower in such a manner that they can be made to revolve so as to secure any angle of fire, which plan was originated by the authorities of the Vernon. The impulse by compressed air is to be superseded by the simpler and equally efficient system of ejecting by gunpowder. The engines are of the usual type fitted by Messrs. Yarrow in vessels of this class, the cylinders being 14½ inches and 26 inches in diameter by 16 inches stroke. The boiler is of the locomotive type, and contains the usual special features introduced by Messrs. Yarrow & Co. for torpedo boat work. The total heating surface is 1,200 square feet and the grate surface 30 square feet. The indicated horse power on trial was not accurately obtained, but is estimated at 700, the steam pressure being 123 pounds and the engines running at 376 revolutions a minute. It was noticeable that throughout the two hours' trial the speed of the engines only varied within the small limits of 1½ per cent more or less than 376. It is estimated that sufficient coal can be carried for a continuous run of 2,000 knots at a speed of ten knots an hour, the bunkers holding about twenty-three tons. Says *Engineering*: 'This most recent addition to our torpedo fleet would undoubtedly prove a very formidable antagonist at sea, being sufficiently powerful to operate in any reasonable weather. She is the result of the accumulated experience of several years, and the country is to be congratulated in having got her and her sister vessels well to the fore before they are actually wanted.

The Lowest Known Temperature.

In a former memoir (*Comptes Rendus*, xcviii., p. 365), the author describes the apparatus which enabled him to eliminate the influence of ethylene upon liquefied gases, and to obtain very low temperatures by means of oxygen and of air evaporating in a vacuum. In a subsequent series of experiments the author has further introduced into his apparatus a second tube of very thin glass, and thus isolates the liquefied gases by a double gaseous stratum. The pressure and the temperature being then considerably lowered, he has been able to solidify nitrogen, carbon monoxide, formene, and nitrogen dioxide, and to determine at the same time the temperatures of solidification. By reducing the pressure of solid nitrogen down to 0·004 meter of mercury, he has succeeded in obtaining the lowest temperature known, —225°.—*K. Olszewski.*