

**THE ÆTNA PATTERN GRATE BAR.**

We give an engraving of an improved boiler grate bars of which the special feature is an expansion shoulder that secures the grate against twisting, buckling, and warping. Engineers always notice that for some time after a new set of grate bars are put under a boiler the fire is more uniform and the consumption of fuel perceptibly less, this being due to the regular and evenly divided openings in the grate surface, which give a uniform and well distributed quantity of air, thus securing perfect combustion. It is, however, but a short time before the bars begin to twist and warp out of line; this is caused by the solid shoulders preventing the necessary expansion sideways, resulting in large openings between some bars and corresponding smaller openings between others.

The smaller openings do not furnish sufficient air for proper combustion, while the larger openings admit too much air and waste considerable fuel by allowing it to drop unconsumed into the ash box.

Too much care cannot be used with reference to the grate bars under a boiler, as here usually is the greatest waste about an establishment, and where the cost of fuel is an item, the price of a set of grate bars is nothing compared to the waste in fuel caused by incomplete combustion.

Various devices have been patented to obviate these difficulties, but most of them are complicated and expensive, and, therefore, have not come into general use.

All engineers will agree that of the common grates those are best which are cast single, being moulded on the side, thus securing the best metal on the face of the bar.

The Ætina bar is a single piece with a diamond opening cored through the shoulders, so that each bar will take up its own expansion and thus prevent twisting and warping. These bars are cast on the side, and are made from metal especially adapted to contact with fire.

Another great advantage of the Ætina bar is, that though somewhat lighter than the common bar it is stronger and vastly more durable, and as it is sold at the same price per pound, is therefore cheaper, the manufacturers are thus enabled to make a specialty of these bars and use a special mixture of iron suitable for this purpose. The Ætina grate bars are manufactured by the Ætina Iron Works, Quincy, Ill.

**IMPROVED PUNCH AND SHEAR.**

We give an engraving of a powerful punch and shear made by Messrs. Hilles & Jones, Wilmington, Delaware. This particular machine is provided with an engine permanently attached to the frame, but they are made either with or without the engine, and are furnished in several sizes. When driven by a belt appropriate pulleys are supplied. The machine is provided with a clutch arrangement controlled by a foot lever, by means of which the punch can be stopped and started. For very particular work a hand wheel is used to set the punch before applying the power. The engraving gives an excellent idea of the construction of these machines.

No. 0 will punch  $\frac{3}{4}$  inch hole in  $\frac{5}{8}$  inch iron, 18 inches from edge, and shear  $\frac{3}{8}$  inch iron. No. 1 will punch  $\frac{3}{4}$  inch hole in  $\frac{1}{2}$  inch iron, 20 inches from edge, and shear  $\frac{1}{2}$  inch iron. No. 2 will punch 1 inch hole in  $\frac{3}{4}$  inch iron, 20 inches from edge, and shear  $\frac{3}{4}$  inch iron. No. 3 will punch  $1\frac{1}{4}$  inch hole in 1 inch iron, 25 inches from edge, and shear  $\frac{7}{8}$  inch iron. No. 4 will punch  $1\frac{1}{2}$  inch hole in  $1\frac{1}{4}$  inch iron, 25 inches from edge, and shear  $1\frac{1}{2}$  inch iron.

Messrs. Hilles & Jones are prepared to supply either the punch or the shear separately, and of heavier or lighter patterns.

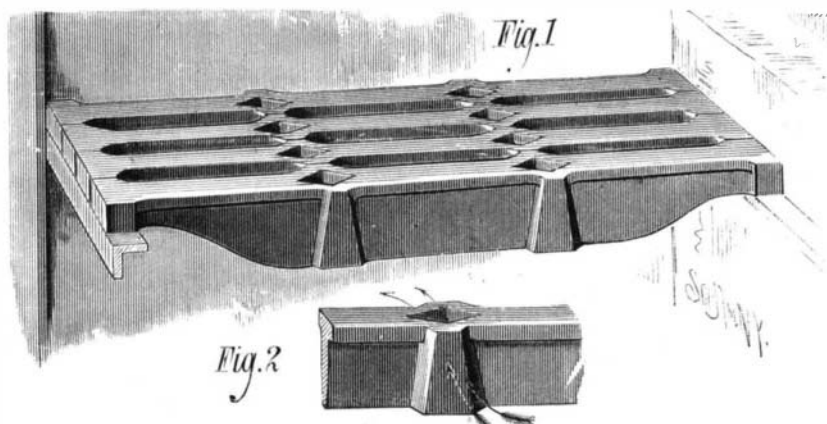
**Substitute for Cod-liver Oil.**

It is claimed by a writer in *Nature* that the oil of the "oolachen" or "ulikon," the candle-fish of Alaska, possesses all the medicinal qualities of cod-liver oil. This fish has long been an ichthyological curiosity, and has been noticed by almost every traveler who has visited the coasts of British Columbia and Southern Alaska. It is a small silvery fish, averaging about fourteen inches long, and in general appearance much resembling a smelt. It is the fattest of all known fish, and affords a very superior oil when tried out. Dried, the fish serve as torches. When a light is needed, the tail is touched to the fire, and they will burn with a bright light for some time. No description can give an adequate idea of their numbers when ascending the rivers from the sea. The water is literally alive with them and appears to be boiling. These fisheries appear not to have been hitherto utilized except by the natives, who esteem the ulikon as a great delicacy. The oil at present is said to be gaining a high reputation in this coun-

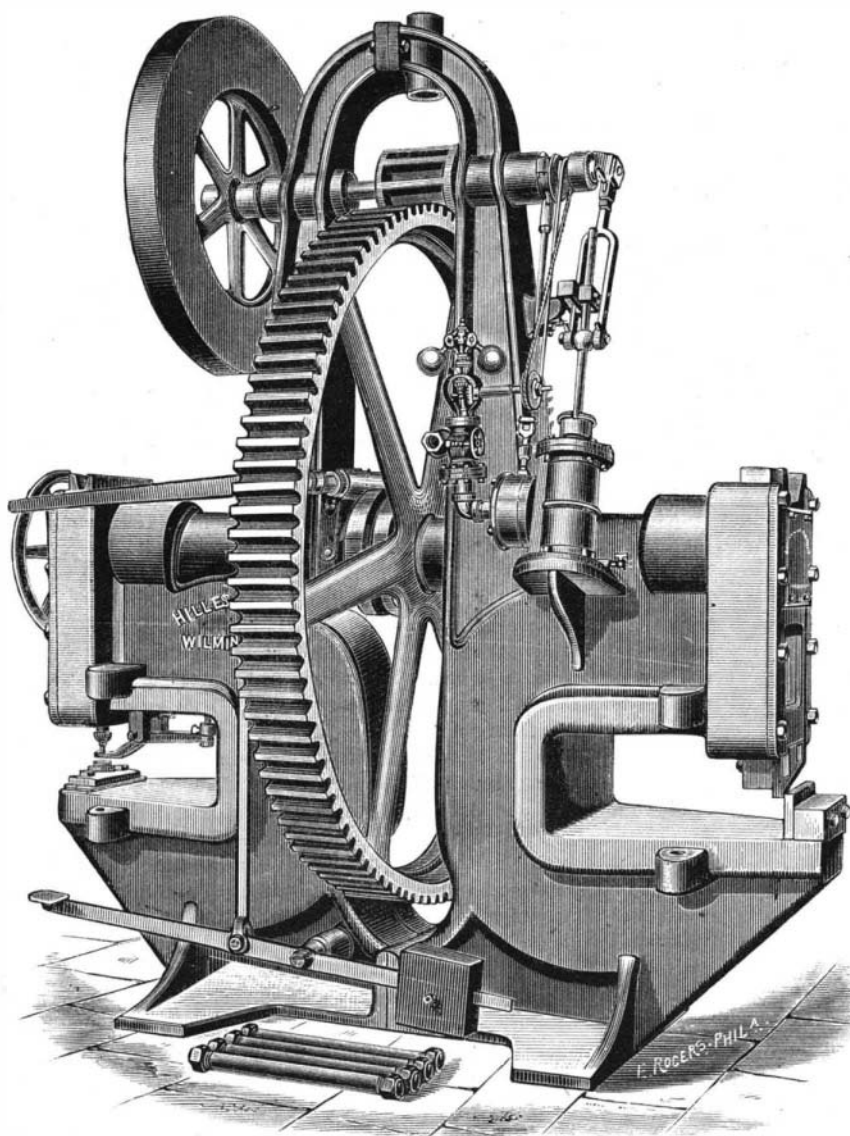
try, and has recently been introduced into England, where it will probably take "a prominent place as an important medicine."

**The Value of Wide-awake-itiveness.**

A certain degree of tension is indispensable to the easy and healthful discharge of mental functions. Like the national instrument of Scotland, the mind drones woefully and will discourse most dolorous music, unless an expansive and resilient force within supplies the basis of quickly responsive action. No good, great, or enduring work can be safely accomplished by brain force without a reserve of strength sufficient to give buoyancy to the exercise, and, if

**THE ÆTNA PATTERN GRATE BAR.**

I may so say, rhythm to the operations of the mind. Working at high pressure may be bad, but working at low pressure is incomparably worse. As a matter of experience a sense of weariness commonly precedes collapse from "overwork;" not mere bodily or nervous fatigue, but a more or less conscious distaste for the business in hand, or perhaps for some other subject of thought or anxiety which obtrudes itself. It is the offensive or irritating burden that breaks the back. Thoroughly agreeable employment, however engrossing, stimulates the recuperative faculty, while it taxes the strength, and the supply of nerve force seldom falls short of the demand. When a feeling of disgust or weariness is not experienced, this may be because the compelling sense of duty has crushed self out of thought. Nevertheless, if the will is not pleasurably excited, if it rules like a martinet without affection or interest, there is no *verve*, and, like a complex piece of machinery working with fric-

**HILLES & JONES' COMBINED PUNCH AND SHEAR.**

tion and beated bearings, the mind wears itself away and a breakdown ensues. Let us look a little closely at this matter.—*Dr. J. Mortimer Granville on "Worry"—Popular Science Monthly.*

**NEW INVENTIONS.**

An improvement in rail fences, which admits of the fence being laid in a straight line, and effects a great saving in labor and fence material, has been patented by Mr. Leonard J. Murphey, of Wauseon, Ohio. This improvement consists in a combination with the post and rails of a fence of a rectangular frame composed of vertical side bars and horizontal bars secured at their ends to the side bars, and at the center of their length to the post, whereby spaces are formed on each side of the post for the reception of the rails, which need not be secured.

Mr. James Denton, of Amsterdam, N. Y., has patented an improved attachment for knitting machines. The improvement is designed to provide for making knit fabrics with horizontal, vertical, or diagonal stripes, or other patterns of one or more colors, without breaking the thread whenever the color is to be changed. The machine to which the attachment is to be applied has the usual barbed knitting needles, and a sinker and a presser wheel operating in combination with needles. It also has a thread guide, through which duplicate threads pass, attached to the bearing of the presser wheel. The attachment, which operates in concert with these devices, has a vibrating looped lever for guiding one of the threads and for exposing it on the outside of the fabric, a supplemental lever connected to the looped lever, a reciprocating adjustable cam which is removably secured to the supplemental lever, and a pair of wheels, operated one by the other, and provided with detachable laterally projecting pins for giving a reciprocating movement to the cam and vibratory movements to the

levers, for the purpose of making stripes and other patterns, the number of detachable pins employed regulating the exposure of the thread carried by the looped lever in the pattern. For making different patterns, various changes require to be made, and numerous other details enter into the general combination, which is very ingenious.

William Driscoll, of Taunton, Mass., has patented an improved mould for forming crucibles and other articles of plastic material. This invention relates to moulds for forming crucibles and articles of pottery ware, and it consists in a skeleton frame mould provided with a lining or backing of flexible and porous material. It is preferred to use both a lining and a backing, the latter being of heavier and coarser material than the lining. Springs also may be combined with a two-part mould, for separating the mould after clamping hoops for binding it together have been removed. By employing a porous backing, the water pressed from the composition can escape freely, and the lining will be retained in a comparatively dry condition.

An improved bed attachment for invalids, by which bed-ridden persons may be easily and comfortably attended, has been patented by Mr. Joshua P. Brown, of Crockett, Tex. This invention consists, principally, of a frame pivoted between the side boards of a bedstead and which is provided with a removable seat, the same being adapted to be brought into a vertical position for supporting the invalid in a sitting posture. The head piece and side arms of this frame have secured to them a supporting strip of canvas, which is fastened at its bottom to a sheet of like material that is firmly secured at its front end to the head-board of the bedstead, and passes at its opposite end over a roller, by which it may be slackened, or be stretched and held taut, accordingly as it is desired to adjust the invalid into a sitting or a recumbent position. These two canvas attachments, which form the back of the frame, constitute the bed bottom, on which the mattress may be placed. The removable seat consists mainly of an upper board having an opening in it which may be covered by a pivoted cushion, a bottom board provided with means for holding a utensil, and flexible or hinged connections between said boards. This seat is supported by the side arms of the pivoted frame and constructed to engage with hooked hinged arms which serve to retain the seat in position between the side arms of the frame, and so form an easy and secure support for the patient.

An improved bail for handling barrels, which greatly economizes labor and facilitates the movement from place to place of filled barrels, has been patented by Messrs. James Casey, Sheldon Juniper, and John H. Mitchell, of Savannah, Indian Territory. The invention consists of a handle rod sliding in a bar to the ends of which are pivoted two angular arms having studded and swiveled gripping plates at the lower ends, to which handle-rod the upper slotted ends of the bent arms are held loosely, said handle-rod being provided with a series of transverse grooves, in which a latch pivoted on the transverse bar catches. The swiveled gripping plates are pressed

against the ends or heads of the barrel, and are held in place by the latch, the barrel being rolled or trundled by means of the handle-rod.

An improved window reflector or mirror, which is readily adjustable in its inclination to the window and in its inclination to the vertical plane, to provide for exhibiting objects at a greater or less distance and at different heights from the ground, has been patented by Mr. Andrew G. Moodhe, of Stillwater, Minn. The invention consists in a window reflector composed of two mirrors, each pivoted at the middle of the adjoining ends to a plate in which a small shaft is loosely mounted, having a hand wheel on one end and a pinion at the other end, which pinion engages with two curved racks pivoted to the inner sides of the mirror, whereby the inclination or angle of these two mirrors will be varied by rotating the pinion. The lower ends of the mirrors are connected by small wires with a transverse strip pivoted to the lower end of the plate to which the mirrors are pivoted, and provided with a small shaft with a hand wheel at the end for changing the vertical inclination of the mirrors.

Mr. Jacob R. Scott, of Nyack, N. Y., has patented an improvement in machines for sewing boots and shoes, which supplies a desired need in a very simple manner. This invention relates to sewing machines for sewing boots and shoes, or materials varying in thickness, and its object is to obtain a variable stroke of the needle regulated by the movement of the presser bar, according to the thickness of material being sewed. The invention consists in a cam sleeve fitted for movement by a cam on the presser bar, and arranged to raise the fulcrum post of the needle bar as the presser bar is raised, so that the presser bar being positioned by the thickness of material, the fulcrum post of the needle is correspondingly positioned.

An improvement in invalid bedsteads, which provides for the more convenient adjustment of the pivoted head, back, and leg or foot rests of the bed, and for the use of suitable vessels with its mattress for the relief of the patient, has been patented by Mr. George B. Davis, of Richmond, Va. This invention consists in a combination with a pivoted head and back rest, of one or more springs for holding said rest in an inclined position when the patient is resting thereon, and a strap passing over a pulley or roller and secured by a buckle, for compressing said spring to vary the inclination of the rest and to hold it in any desired position. The foot rest of the bed is also pivoted, and may be raised or lowered and held by a strap. The invention also consists in the combination with the mattress having a hole in it for the use of a suitable utensil below it, of a cushion or pad closing said hole, and levers for supporting the pad when closing said hole, and providing for its removal out of the way when necessary to expose said hole.

**IMPROVED FIRE ESCAPE.**

The recent calamitous fire in the Ring Theater, at Vienna, in which more than seven hundred human beings were destroyed; the burning of the Brooklyn Theater, in which more than three hundred persons lost their lives; and the frequent occurrence of catastrophes of this kind, demand the provision not only of all possible means of preventing and extinguishing fires, but also of every practicable way of escape from the burning building.

In most theaters and places of amusement the ground floors are provided with exits on the ground, level or at least within a short distance of it, but the galleries are usually destitute of sufficient means of escape.

The engraving shows a device patented by Mr. J. F. Werner, of 62 Center Street, New York city, which is intended to meet this particular case.

The invention consists, mainly, of a movable floor, suspended by chains from near the ceiling of the entrances, halls, and vestibules, or by hinges on the side walls, and lowered in case of fire, to be supported on projecting rests of the side walls, at suitable height above the floor. Sliding extensions and swinging stairs and rear sections connect with the ground outside of the door, and with the staircases of the gallery, so as to form separate exits above the regular entrances.

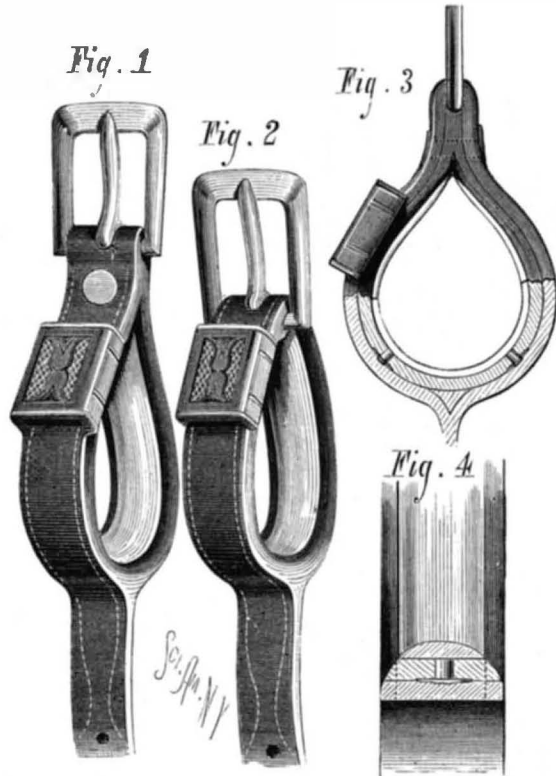
In case of fire the floor is lowered, the swinging sections and stairs swung down, and thereby a second passage formed, which is mainly designed for the people in the galleries, so that they may pass out simultaneously, and without interfering with the people in the parquet.

As it is a matter of experience that the greatest delay in the passage of the people is caused by the choking up of the entrances by the persons rushing out from the parquet, so that those in the galleries have less chance of escape, it is obvious that a practical means by which direct and unobstructed exit for the people in the galleries may be obtained will in a great measure obviate the danger arising from the present defective construction of our theaters. The means described change every entrance hall of a theater into two passages, so that the people may get out in half the time. The galleries are quickly emptied by means of the fire escapes of the entrances, the people being compelled by the bridge sections to pass on to and over the movable floors and their extensions and stairs to the outside of the building. If desired, additional movable stairs, running parallel to and

being suspended in analogous manner to the movable floor, may be arranged in the lower parts of the staircases of the galleries, so that they may also be divided in their height into two passages, that form additional safety devices for the people.

**IMPROVED THILL TUG.**

The engraving represents an improved thill tug recently patented by Mr. Charles B. Pineo, of Bar Harbor, Hancock County, Me. In this device the strap which surrounds the thill is provided with a rigid metallic lining, which is some-

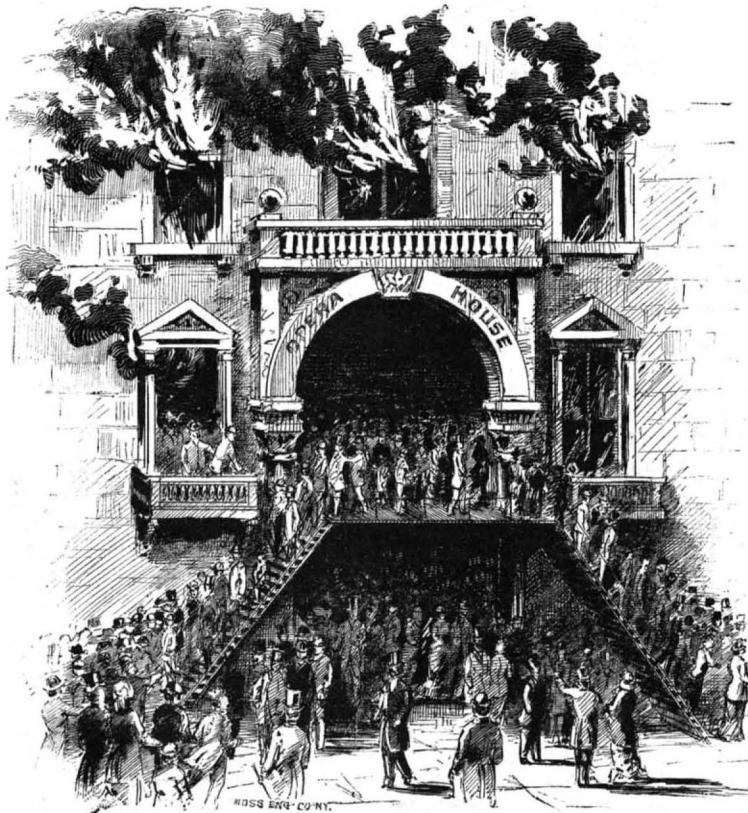


**PINEO'S THILL TUG.**

what narrower than the strap, and is made inwardly convex, so as to take the friction and wear of the thill. The lining also keeps the loop distended, so that it is not drawn tightly against the sides of the thill.

The advantages secured by this improvement are, that the thill tug wears much longer than the ordinary leather tug, and, as it is impossible for it to catch on the thill, the horse can go out of the thills unharnessed, whereas with the ordinary tug it is a common thing for it to catch, and, by sliding the saddle, make the horse's back sore.

This new thill tug can be put into the finest harness with-



**WERNER'S FIRE ESCAPE.**

out injury to its appearance, as it almost invisible when the thill is in the tug, and it is incapable of marring the thill, as it has no sharp metallic edges.

The metallic lining is fastened to the leather lining by four rivets or pins cast on the metal lining. These pins pass through the leather lining and are provided with a bar and headed down.

The engraving shows two forms of thill tug; one (Fig. 1) with the leather straps riveted together below the buckle, the other (Fig. 2) with the buckle at the end of the loop. Fig. 3 shows a side view of the tug partly in section, and Fig. 4 is a vertical transverse section.

**Tannic Acid by Dialysis.**

Kohlrausch sets out with the law that equalization takes place between liquids of different concentration, and for this reason, in tanning leather, when tannic acid particles have been dissolved in the lye, they reach all parts of the surrounding liquid and reach the leather, penetrating its membranes by osmotic action. Part of it unites with the fibers, while part of it is deposited between them. This action is an uninterrupted one, and is repeated as long as the fibers are able to take up more tannic acid, or the solution to give up more. From these considerations Kohlrausch concluded that, not only does the tannin get into the hide by osmosis, but that it must pass through the permeable membrane of the plant cells in a similar manner, since by the chemical and microscopic examination it is seen that the interior and uninjured cells act just the same as the external pieces of thick bark that have been used. Hence it cannot be a simple solution of the tannin that has been exposed by grinding the bark which reaches the hide and is taken up by osmosis, but there must also be dialysis, partially free and partially membranous, of the tannin, the latter taking place through the permeable membrane of the plant cells, just as it does through the animal membrane of the hide.

These hypotheses have been confirmed by practical experiments, and a large factory has been built in Vienna and is working profitably by this method. The rasping and grinding of the bark is no longer necessary, since it can be used in larger pieces. The dialysis of the tannin takes place in a battery of closed vessels. The loss that was unavoidable in the old process, owing to decomposition setting in, is here reduced to a minimum by excluding the air. Generally about 96 to 97 per cent of the tannin is obtained, as in gall-nuts, and even in pine and fir barks, where the resin that accompanies it renders its extraction more difficult, they claim to get 92 per cent, and from the oak bark 100 per cent of its tannin, while by previous methods the loss approached 40 per cent. The new process threatens to revolutionize the whole tanning operations, but especially the manufacture of extracts, not only of tannin, but also of most vegetable dye-stuffs soluble in water or alcohol. D. J.

**Antarctic Whales.**

With regard to animals, we saw not a single seal on the ice or in the water during our southern trip. No doubt we did not go far enough south or sufficiently among the pack ice to meet with them.

When we were off the pack ice, and especially when we neared the Antarctic Circle, whales were extremely abundant, apparently all of one species, a "finback," probably the southern "finner" (*Physalus australis*). I saw no right whale among them at all.

As these whales moved under water close to the ship the light reflected from their bodies lighted up the water around and enabled one to follow their movements.

I several times went away in a small boat from the ship to shoot birds for our collection. On these occasions the whales sometimes blew quite close to the boat.

The appearance of a whale's spout, as seen from the level of the sea, is very different from that which it has when seen from the deck of a ship; it appears so much higher, and shoots up into the air like a fountain discharged from a very fine rose. The whale, of course, in reality does not discharge water, but only its breath; this, however, in rushing up into the air, hot from the animal's body, has its moisture condensed to form a sort of rain, and the colder the air, just as in the case of our own breath, the more marked the result. When the spout is made with the blowhole clear above the surface of the water it appears like a sudden jet of steam from a boiler.

When effected, as it sometimes is, before the blowhole reaches the surface, a low fountain, as from a street fire plug, is formed, and when the hole is close to the surface at the moment, a little water is sent up with the tall jet of steam.

The cloud blown up does not disappear at once, but hangs a little while, and is often seen to drift a short distance with the wind.

The expiratory sound is very loud when heard close by, and is a sort of deep bass snort, extremely loud and somewhat prolonged; it might even be compared to the sound produced by the rushing of steam at high pressure from a large pipe.

Smaller cetaceans, probably of a kind of grampus (*Orca*) were very common near the Circle. These had a high dorsal fin placed at about the middle of the length of their bodies. Immediately behind the fin there was a large white saddle shaped patch, extending across their back, and they had, further, a conspicuous white blotch on each side, just behind the head and in front of the flippers.

The white patches contrasted strongly with the dark general color of the body.

These grampuses swam about in small shoals, with their high dorsal fins projecting far out of the water, like those of sharks do sometimes, and also those of swordfish.

The grampuses seemed habitually to swim thus, and the group of pointed sickle-shaped black objects moving through the water had a curious appearance at a distance. I cannot