may have passed the flues of the ammonia still, but they are really washers. They are two wrought iron vessels, each vessel being divided into four compartments, and in each compartment a plate with serrated edge depends from the top and dips into the liquid; the bottom of the vessels slope toward the front. The gases are thus caused to pass four times under water, and it is found that most of the tar is given off at these vessels, and that they answer the purpose of arresting the dust. These vessels are arranged so that either can be shut off for cleaning (if this should ever be required) while the gas is passed through the other.

The gases at the outlet of the dust boxes are found to be very much reduced in temperature, and are then brought down to the temperature of the atmosphere by two pipe condensers. These condensers consist of 100 wrought-iron pipes, 40 feet long and 20 inches in diameter, placed in five rows of twenty each upon a cast-iron box, which contains the necessary division plates for shutting off each row from the other, while allowing the condensed matters to flow underneath. This cast-iron box has also a sloped bottom similar to the dust boxes. Valves are fixed at the end of each row of pipes, so that any row can be shut off; and by taking off the blank flanges from the top, each pipe can be cleaned if this should ever be required. Arrangements are made at the top of these pipes so that cold water is directed on to them, and thus the condenser is rendered very effective. The gases are then drawn through the exhausters, which consist of four of Root's blowers, driven by a pair of horizontal engines. The blowers have valves fixed at the inlet and outlet, so that they can be shut off for repairs if necessary. Following the exhausters come four washers, the gas dividing through the first two, and then again dividing through the other two. These are arranged in pairs, with valves, so that they can be shut off and cleaned if required without stopping the whole of the apparatus. The interiors of these washers are fitted with four plates with holes varying in size and getting smaller toward the outlet, the last plate of the last washers having holes $\frac{1}{16}$ inch diameter. The object of these is to take out the last traces of tar before the gas gets to the scrubbers, and this they do very effectually.

The gas then enters four round scrubbers 100 feet high and 12 feet diameter, which are filled with about 300 tons of wood boards, and on the top of each of the first three scrubbers is an apparatus for distributing the liquor over the boards. This apparatus is self-acting, each scrubber having a large steam pump which pumps the ammoniacal liquor through all four scrubbers alternately. The last one has clean water pumped through it, though in much smaller quantity than through the others. This scrubber takes out the last trace of ammonia, and the gas then passes on to the boilers. The scrubbers, being set in a square, stand very firm; in the center between them is a spiral staircase. The scrubbers are made in rings of plates 5 feet deep, and in each ring of plates is a flap valve, held to its face by a heavy weight, so as to give immediate release in case of an explosion. These valves also act as manholes to the scrubbers, being 18 inches in diameter. Mr. Dempster has also placed these valves in numerous places about the apparatus, so that each section of pipe or apparatus shall have safety explosion valves. Between the scrubber and the boilers is introduced a box, which is partly filled with water, and has a plate dipping into it, so that the gas can be forced through the water. This is only intended to be used when the plant may have been standing and is being again put into operation, as, if the gas should be sent on to the boilers too soon, any explosion would only strike back as far as this box.

This apparatus has been at work about two months, and from its first being put into operation has continued to give every satisfaction. The whole arrangement was so well considered beforehand that no alterations have yet suggested themselves as being required. The firm are now erecting plant to deal with the tar, it being the intention when the present plant was designed to sell the tar to the neighboring tar distillers. The price of tar, however, has fallen so low that it is considered most profitable to distill the tar on the premises, and thus save any cost of carriage. Mr. Dempster claims as the advantages of this apparatus, first, that he does not consume any of the gases in working the plant, nor does he injure the quality of the gases in any way, no vapor being carried along with the gas, or any acid vapors; and secondly, that he gets his ammonia liquor up to a good strength of NH_3, and that the labor is very small, two men for day and two men for night being all that are required to work it. The cost of this apparatus is, we understand, about £6,000 per furnace. The sulphate of ammonia, paraffin wax, heavy paraffin, and light oils recovered by this process from the blast furnace gases at Messrs. Heath's works are of excellent quality, as evidenced by the samples inspected by us. The products from the tar given off from the furnace gases are stated to be more valuable than the products obtained at the present time from the ordinary gasworks tar.—*Iron.*

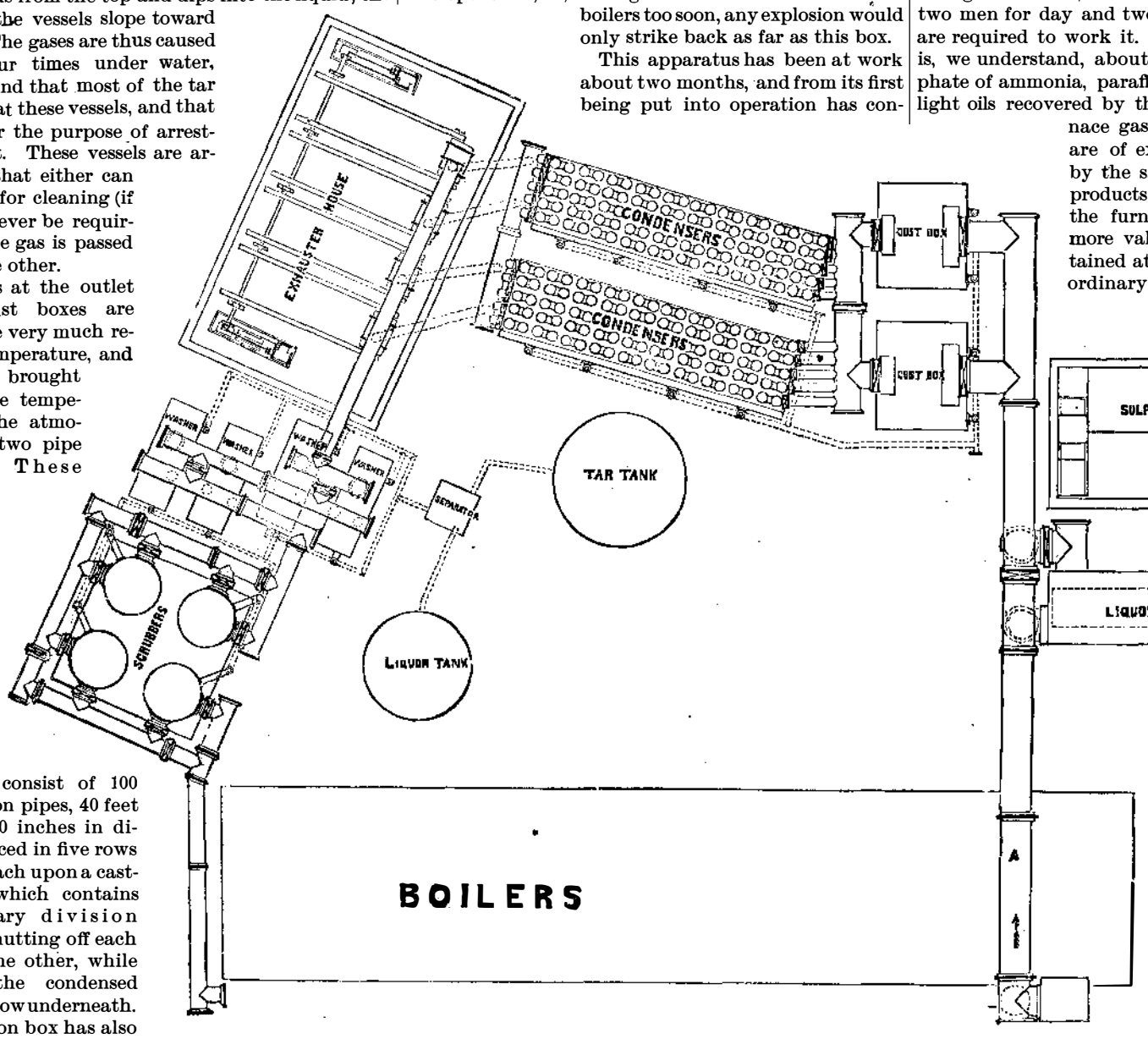
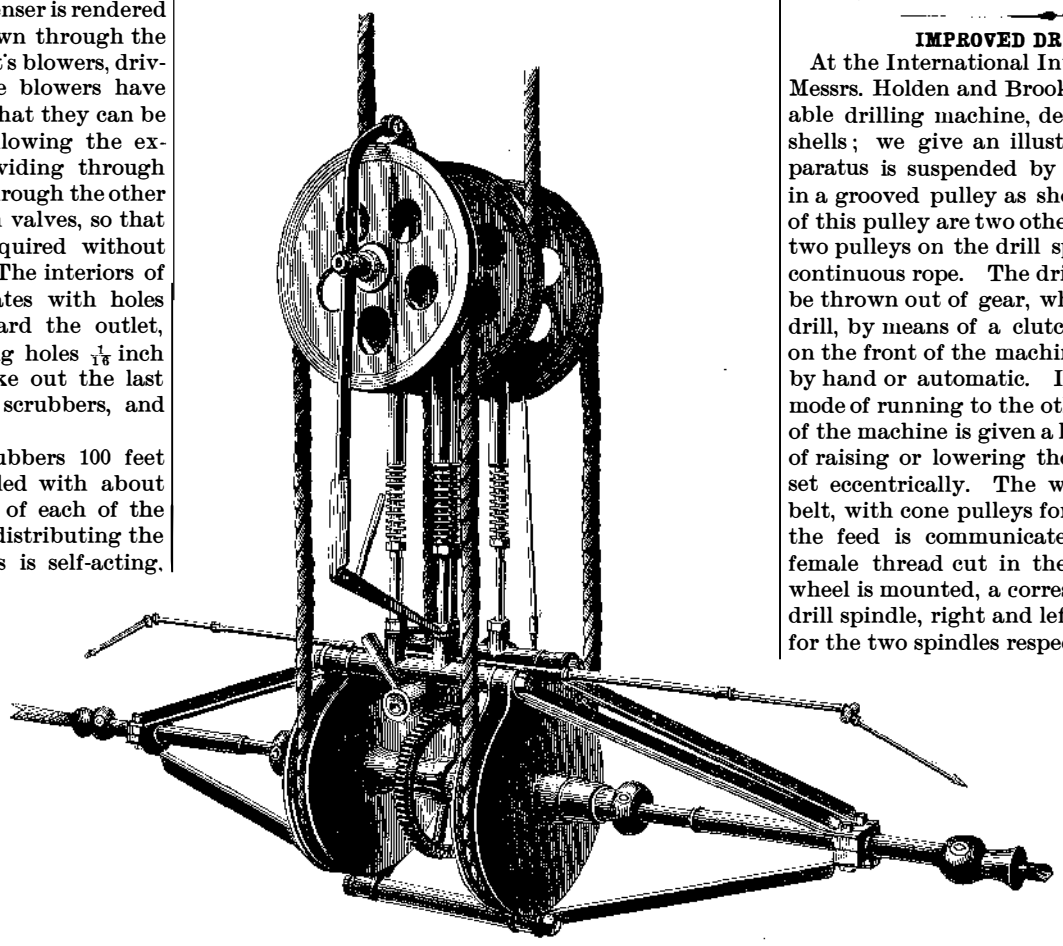


Fig. 2.—PLAN VIEW.—APPARATUS FOR RECOVERY OF TAR AND AMMONIA.

A NEWSPAPER correspondent describes the American watch manufactory at Waltham, Mass., and in speaking of the astonishing minuteness of some very essential parts of the watch says: "A small heap of grain was shown to us looking like iron filings or grains of pepper from a pepper caster—apparently the mere dust of the machine which turned them out; and these, when examined with a microscope, were seen to be perfect screws, each to be driven to its place with a screw driver. It is one of the statistics at Waltham worth remembering that a single pound of steel, costing but 50 cents, is thus manufactured into 100,000 screws, which are worth $11."

IMPROVED DRILLING MACHINE.

At the International Inventions Exhibition, London, Messrs. Holden and Brooke, of Salford, exhibit a portable drilling machine, designed to work inside boiler shells; we give an illustration of this tool. The apparatus is suspended by its driving rope, which runs in a grooved pulley as shown. Mounted on the shaft of this pulley are two other pulleys, one of which drives two pulleys on the drill spindle below, by means of a continuous rope. The driving pulley of this series may be thrown out of gear, when it is required to stop the drill, by means of a clutch operated by a lever shown on the front of the machine. The feed may be either by hand or automatic. In order to change from one mode of running to the other, the small handle in front of the machine is given a half turn. This has the effect of raising or lowering the worm, as the worm shaft is set eccentrically. The worm gearing is driven by a belt, with cone pulleys for different rates of feed, and the feed is communicated to the drill spindle by a female thread cut in the sleeve on which the worm wheel is mounted, a corresponding thread being on the drill spindle, right and left handed threads being used for the two spindles respectively. As the drills run in opposite directions, they can both be ground right-handed. A feed of 9 inches can be given to each drill; and for variations in the diameter of boiler shells beyond this compass and up to 8 ft. diameter, intermediate lengths of spindle have to be introduced. The spiral springs shown on the vertical distance rods are for the purpose of keeping the stretch on the driving rope, so that the pulleys will not slip with heavy work. As rigged for work, the driving rope from the countershaft runs over a guide pulley mounted in a sliding frame. This pulley is counterbalanced, and in this way the whole machine may be raised and lowered with facility by one man.—*Engineering.*



IMPROVED BOILER DRILLING MACHINE.