FLOATING FIRE ENGINES.

The use of floating fire engines is rapidly extending in all commercial cities, where wealth, in buildings and merchandise, is always aggregated on the banks of the rivers, readily accessible to vessels, and with an unlimited supply of water at hand. Some improvements in these engines have recently been effected by Messrs. Merryweather and Sons, of London, England, and three of them, of the most powerful construction, have been supplied to the French Government. The long lines of shipping which bound this city, and the dangers of fire to which, from many causes, it is exposed, give especial interest to these useful machines at the present time.

On the trial trip of one of the engines, which is now on duty at Marseilles, France, the little vessel, full of passengers, left the pier at Charing Cross and steamed with the tide to Battersea bridge, which she reached in twenty minutes. She steamed a short distance beyond the bridge, and was then turned, running back against tide, and reaching the Charing Cross pier in 56 minutes from the time of starting. On her way back she was stopped at Millbank and successfully beached; the object of the manœuver was to show that she could approach inshore sufficiently close to enable men to convey hose on to land without having to pass through deep water. The total distance run by the float—in and out—was three miles and two thirds, the time occupied being 56 minutes, including the stoppage for the beaching operation. On her way up the river, time was taken between the Chelsea suspension bridge and the Cadogan pier, a distance of exactly three quarters of a mile. The time was exactly 4 minutes, giving a speed of about 12 miles an hour with tide, the time on the return against tide between the same points being 7 minutes, or at the rate of about 6 miles an hour. During a portion of the distance only one engine was at work, besides which she had a number of passengers on board, so that the average speed of about 9 miles an hour which she attained was a very successful result. On reaching Charing Cross pier, the pumping engines were set to work and a fine jet was thrown from a 1¾ inch nozzle to an estimated hight of 180 feet. Two jets were then played from 1¼ inch nozzles and afterwards four jets from 1 inch nozzles to an estimated hight of 160 feet. The whole performance was in every way satisfactory.

Turning now to Figs. 1 and 2, it will be seen that the vessel is a neat boat 45 feet in length, 8 feet beam, with 2 feet draft forward, and 2 feet 10 inches aft, and having a total depth of 4 feet 6 inches. Her builders were in some measure restricted as to the dimensions of the boat, as a vessel of larger dimensions cannot be conveniently loaded on shipboard in one piece for transport. The boat, however, is not cramped, as there is ample room for coals, hose, stores, and cabin compartment. The propelling engines are two in number, each working a gun metal screw 28 inches diameter. The cylinders of those engines are each 5¾ inches in diameter, with a 6 inch stroke, the number of revolutions being 280 per minute, and the steam pressure 75 lbs. per square inch. These engines work independently of each other, in order to facilitate the manœuvering of the float, which will have to run in and out among shipping; and during the recent trials on the Thames it was jocosely called the blockade runner. By adopting twin screws the vessel is able to travel in shallow water, a very desirable feature in running up creeks. The boiler is on the Field principle, and is arranged to drive the propelling engines and steam fire engine simultaneously, if required, and this would happen in the case of a fire among shipping, wherein this engine might not only have to be engaged in towing out a burning vessel, but in pumping upon her at the same time. The boiler has a large water and steam space; and considering the quantity of water it has to convert into steam at 75 lbs. pressure, and notwithstanding the large cubic contents to be filled by steam before reaching that pressure, it effects this object in the very short time of 10 minutes. The boiler contains 426 Field tubes, giving 236 square feet of tube surface, and 35½ square feet of fire box surface, and is mounted with the usual fittings, having one pressure gage for the stoker and another for the engine driver, a spring safety valve and another on an improved principle, gage cocks, whistle, etc. It is fed by feed pumps attached to each propelling engine, by another long stroke feed pump on the fire engine, also by an arrangement by which the whole supply of the fire engine pumps (11·6 gallons) can be forced direct into the boiler by one stroke, and, lastly, by a Giffard's injector.

The steam fire engine, while limited in weight and space, is simple, and of sufficient strength to stand the rough usage to which such machines are usually subjected. The pumps have a steady stroke of 24 inches. There is no dead point in the course of the pistons, and the engine will start with the latter at any position in their stroke as soon as steam is turned on. Another advantage is that the engine can be worked at full speed, or at any intermediate speed, in the event of a limited supply of water, or as slow as one or two strokes per minute. This enables the attendant, in case of need, to pump direct from the main pumps into the boiler—a feature peculiar to these engines, and of great value when, by neglect, the water is short in the boiler, or for the purpose of lowering the pressure of steam on suddenly stopping the engine. The pump is arranged to throw any class of water, whether it be muddy or floating with sea weed, shavings, etc., the valves being specially adapted for such purpose—an important feature.

Our engravings represent general and detail views of the float and its engines, Figs. 3 and 4 being respectively a plan and a sectional elevation of the vessel, and Figs. 1 and 2 a plan and elevation of the pumping engine. In these views, A is the framing, forming the bedplate of the engine. The frames are supported on a series of bearers fixed in the boat, and are also connected with the boiler, thus forming one rigid structure, and which does not exhibit any vibration of the vessel, when all the machinery is in full operation. B is the boiler, constructed on the Field system; the tube and top plates are of the best boiler iron, the shell of steel five sixteenths of an inch thick. The top and tube plates are fitted with eight screwed stays; the top plate has four hand holes, and the water casing around the fire box has six mud holes, and blow-off cocks. The chimney, C, is hinged for raising and lowering, and is fitted with counterbalance and chain. The steam cylinders, D, are each 8¾ inches diameter and 24 inch stroke, and are cast in one piece. They are fitted with wrought iron covers and gun metal glands, and are fixed to the frames by strong brackets and bolts. E is the main pump, which consists of one solid gun metal casing, formed in such a manner that the barrels are not cut or cored when pumping sandy water, and having the valves so constructed that any grit drawn into the pump does not pass into the pump barrels, but is discharged at the next stroke through the delivery valves. These valves are placed in the lowest part of the valve chamber, instead of in the highest part, as is usual in most pumps; and as all water runs freely out of the pump when at rest, the latter are not liable to be disabled by frost. The valve openings are large and quite free, having no gratings to impede the passage of solid materials, while the valves and seats are readily removed for inspection or repairs. The pump pistons are self-lubricating, and when at work never require the application of the oil can. F F are wrought iron stays, coupling the steam cylinders direct to the pump in a rigid manner, thus relieving the frames of all strains during pumping. The piston rods, G, connect the steam pistons with the pump pistons, and are formed of solid steel throughout without a joint. The crossheads, H, are keyed on the piston rods, and carry gun metal clip brasses, H′, which slide along, and give a partial revolution to the motion bars, I, and these bars actuate the valve levers. The main piston slide levers, K, fit easily on the motion bars, and are actuated by the tappet clutches, K′ Levers, L, are fixed to the motion bars, I, for moving the small leading piston slides, L′. The starting levers are seen at M, and at N are the main piston equilibrium slide valves for reversing the flow of steam into the cylinders, these slides

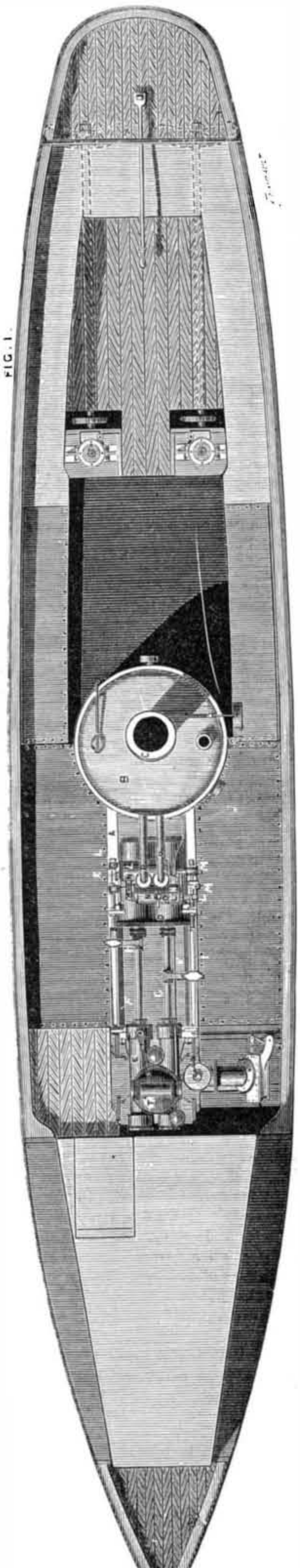


FIG. 1.

MERRYWEATHER'S FLOATING FIRE ENGINE—PLAN OF VESSEL

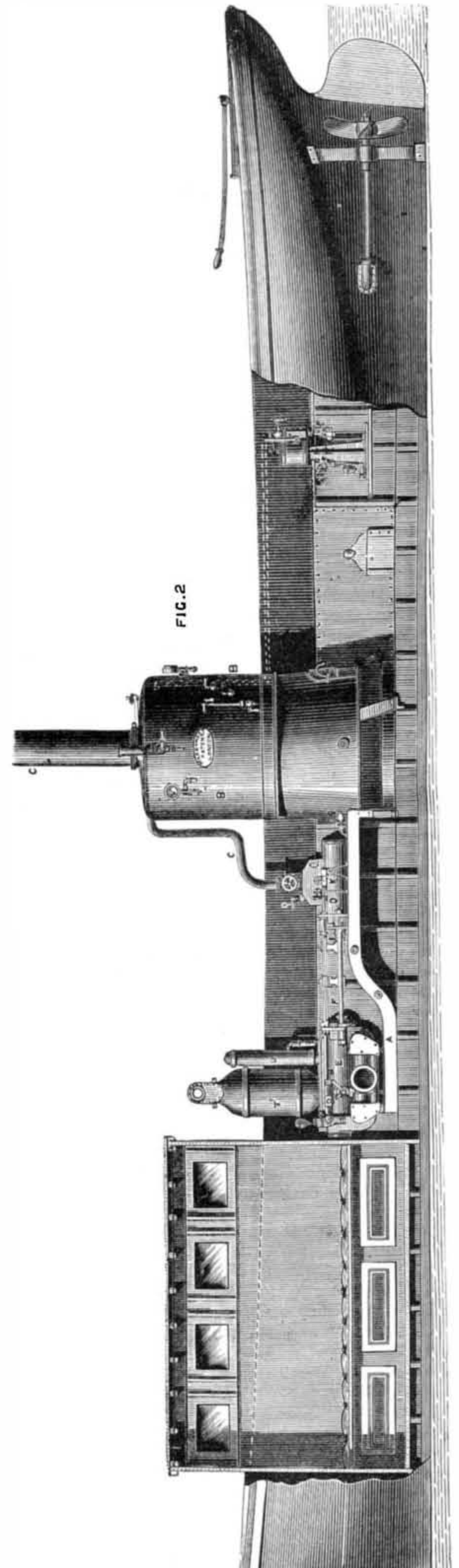


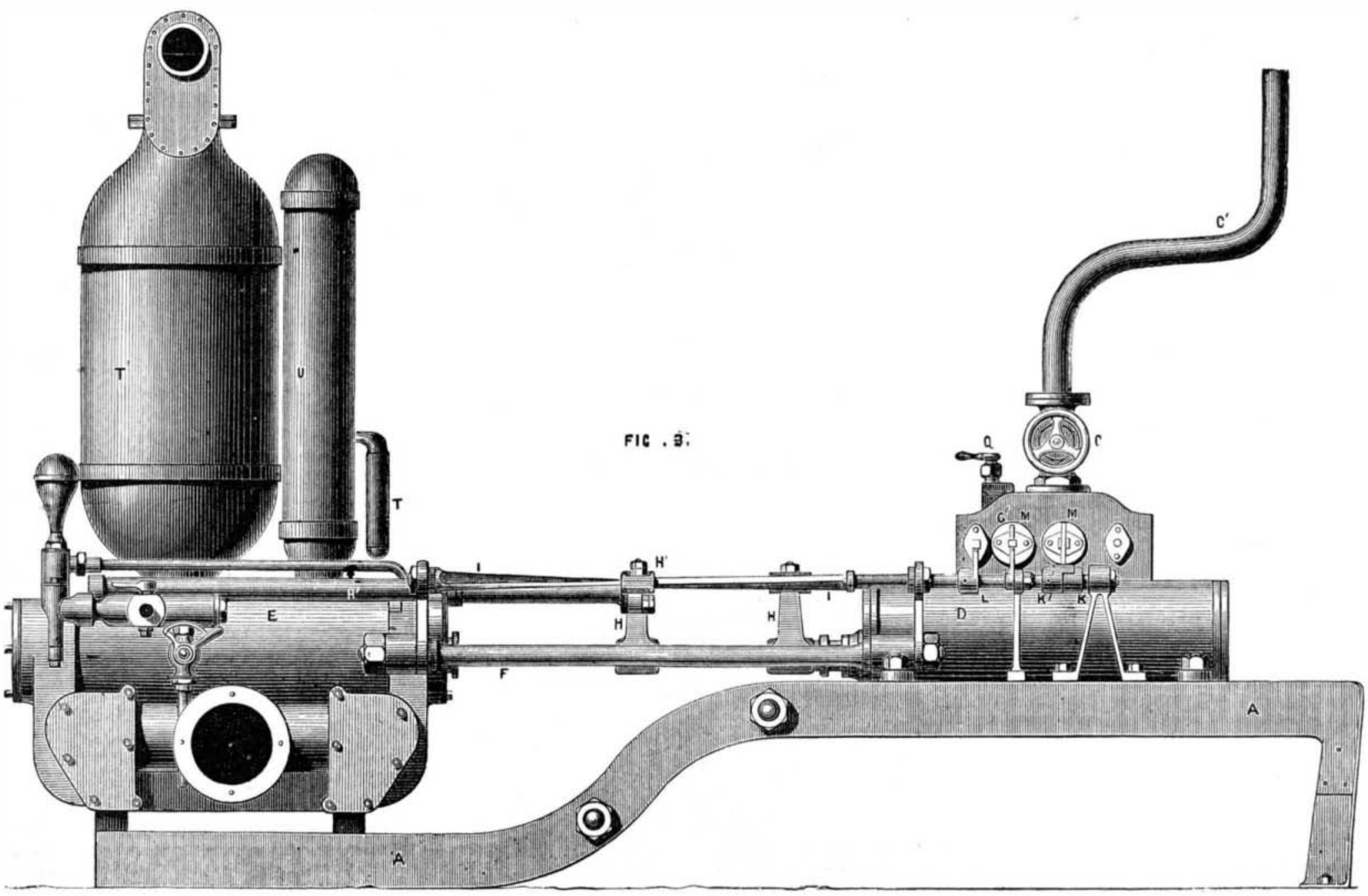
FIG. 2

MERRYWEATHER'S FLOATING FIRE ENGINE—ELEVATION OF VESSEL.

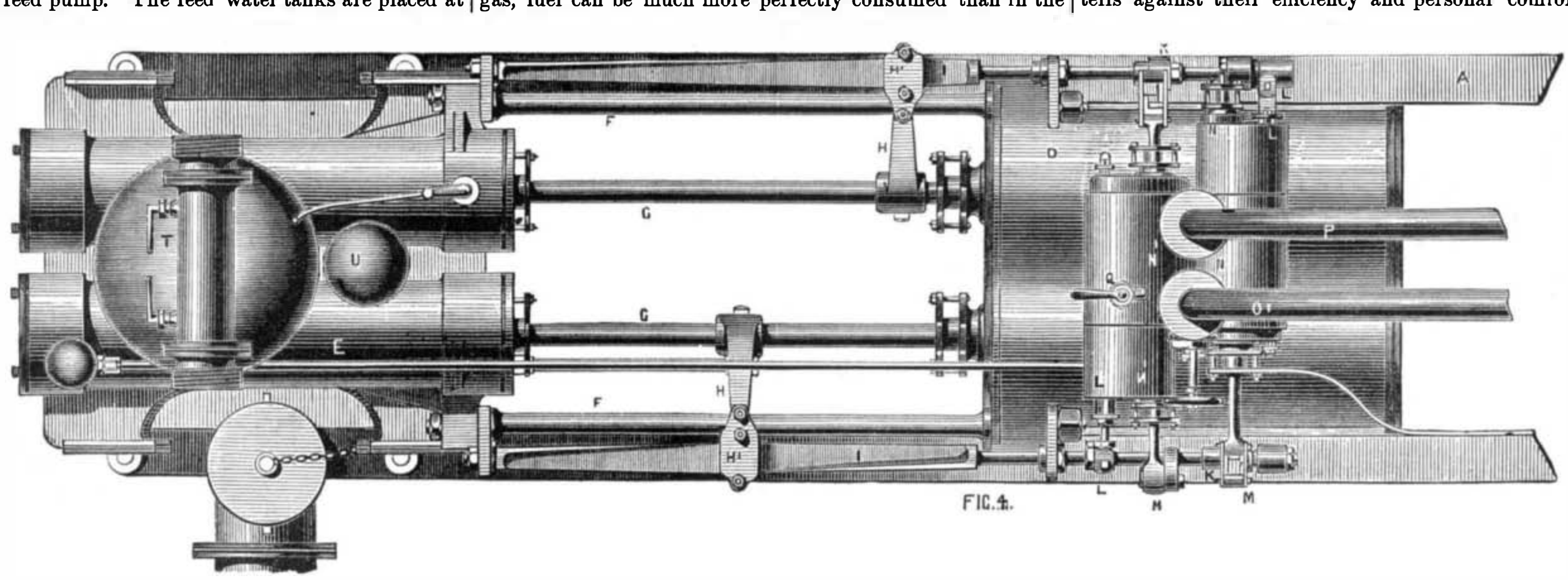
being so constructed that, when they are in the middle of their stroke, the steam ports are quite closed, preventing the inlet of more steam, and the exit of the exhaust steam, and thus bringing the steam and pump pistons to rest. At one end of each of the piston slide rods, N', is attached a small piston working in a cylinder, to which steam is admitted by the leading piston valves, L'. The power used to move the slide is merely nominal, not throwing the least strain on the motion bars, I, and as a proof of this a slide can be pushed, arrested, or forced forward by hand while the engine is working.

O is the starting steam valve in the steam pipe, O'. The exhaust pipe, P, passes down the chimney into a hollow baffle, having an aperture upwards, through which the exhaust steam passes into the chimney, affording the necessary blast. Q is a small steam valve for admitting steam to the small cylinders, Q'. The feed pump, R, is easily accessible. There is a pipe from this feed pump to the fresh water tanks. The plunger is of steel, and covered with brass, the diameter being 1 inch and the stroke 24 inches. The plunger is fixed to the crosshead, H, on the driving side. S is a check valve in the feed pump pipe to the boiler. T is a patent air vessel automaton feed apparatus for keeping up the required amount of air in the air vessel, T', to insure a steady jet of water at the nozzle. U is the suction air vessel, and V a pipe from the main pumps to the boiler, the water passing direct through the feed pump. The feed water tanks are placed at each side of the fire engine under the deck; there is also another tank immediately under the engine. The coal bunkers extend along each side of the boiler, as far back as the propelling engines; there is therefore an ample supply of fresh water, and a large capacity for carrying coals.

The pumping power of this little float is very great, being 1 000 gallons per minute through a jet 1¾ inches in diameter to a hight of 212 feet. It is arranged to pump 4 jets, and these, each 1 inch diameter, can be thrown to a distance of 200 feet.



MERRYWEATHER'S STEAM FIRE ENGINE—ELEVATION.



MERRYWEATHER'S STEAM FIRE ENGINE—PLAN.

BUTTER is said to be a very sensitive reagent to reveal the presence of copper.

Economy in the Use of Fuel.

In a paper on economy in the use of coal, lately read before the Royal School of Mines, Berlin, the following synopsis of interesting historic facts is given: The progress in the economical consumption of fuel in the last 50 years has been enormous, and has been effected in great part by metallurgists; and here again we find the scientific men taking the lead. In the economical application of the heat developed by fuel, the Bessemer process is enormously effective, not more than 10 lbs. of coal being requisite for the production of 1 cwt. of steel from pig iron by this method, while in the older process, still in use for fine qualities of steel, 250 lbs. are needed. Siemens, by making the heat which would escape through the chimney of an ordinary furnace warm the fuel and the air necessary to combustion, obtains an economy of two thirds the weight of fuel. It was Faber de Faure, an accomplished Bavarian metallurgist, who first made practical use of the gases which formerly escaped in immense quantities from the tops of blast furnaces; and the enormous blast engines, the hoisting engines, pumps, and hot blast stoves, even the roasting kilns of such establishments now-a-days require no fuel except this long neglected waste product. Bischof, another German engineer and metallurgical author, was the first to produce gas artificially for smelting purposes, and this was certainly one of the greatest advances ever made in our art. By first turning it into gas, fuel can be much more perfectly consumed than in the solid form, and hence can be made to give us, as in the Siemens furnace, in which only gas is used, a much higher temperature than is practically attained by the combustion of coal in the ordinary way; but perhaps the greatest advantage of gas is that substances, in general scarcely regarded as fuel at all, can be employed for the production of gas with the most brilliant results, a matter of the greatest importance, especially in a region destitute of true coal like California. Lundin, a noted and thoroughly educated Swedish metallurgist, has taught us how to produce gas from wet sawdust, entirely without preparation, of such power that wrought iron may be melted with it, and the great difficulty is to find any material infusible enough to answer as a lining in the furnace where it is consumed. Some idea of the importance of these improvements will be had from the fact that the economy in fuel effected in England alone, in the year 1872, as compared with 1871, by the progress made in the introduction of more perfect apparatus, represented more than 4,000,000 tuns of coal.

Heavy vs. Light Tools.

The great end at which all improvements aim is the maximum of power combined with the minimum of material and weight. A man shoveling dirt with a shovel one pound heavier than it should be will lift 6,000 pounds more in a day of ten hours than he would do with a suitable shovel All this strength is wasted.

The same is true of machinery. So simple a thing as an unlubricated pulley is felt in the furnace, and the cost of the coal is augmented. Every useless pound in a truck or carriage takes vitality from the horse which draws it, and costs the owner many extra dollars for his keeping. The man who pulls an oar in the great boat races at Saratoga puts himself in training and reduces every ounce of surplus flesh. The racing horse carries not one extra ounce of fat to burden him in the effort to win. Yet working men will carry through half their lives fifty pounds more flesh than is needed for the best working condition, a burden which tells against their efficiency and personal comfort through many years of their industrial life. These may seem little things; but whatever wastes power, increases expenses, and burdens the laborer is not a little thing.

THE new direct Atlantic telegraph cable has been successfully laid, and messages have been transmitted at a high rate of speed between New York and London. But the ice bergs have, it is supposed, injured the cable, and the contractors are now fishing up and cutting out the fault.

THERE are twenty-three miles' length of pneumatic tubes now in operation in London, used for sending telegraph messages.