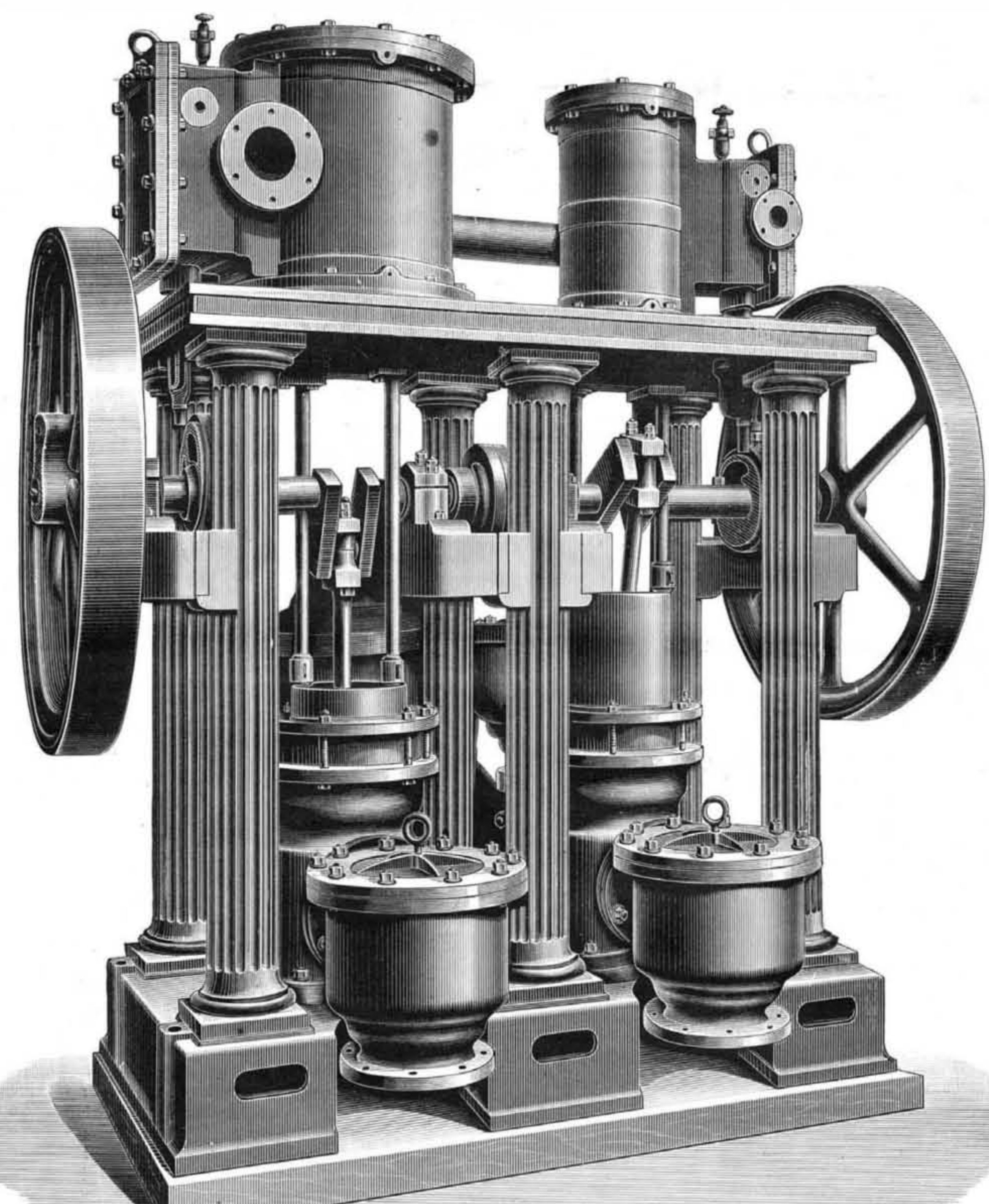
IMPROVED PUMPING ENGINE.

We give below a perspective view of a pumping engine recently put down at the water works, Northwich, Cheshire, for the purpose of supplying the whole of the town with the necessary water. The engine was constructed by Mr. John Wolstenholme, of Radcliffe, Lancashire, and the high and low pressure cylinders are 14 inches and 24 inches in diameter respectively, with a stroke of 15 inches, and are provided with pistons on Mather and Platt's principle, with weldless steel coils and cast iron casing rings. The piston rods (of Bessemer steel), two to each cylinder (working through stuffing glands), are fitted direct into the rams, preparation being made on the outer edges of the rams (which are cast hollow with open tops), and bored to receive the rods. The rods are afterward cottered up, and have wrought iron bushes on top with taper steel cotters, which tighten up the cotters in rams and allow them to be taken out at any time with ease. The rams and pump barrels (14 inches bore) were cast vertically in dry sand moulds.

The preparations for connecting rods are a few inches from the bottom of each ram, and are bored and fitted with steel pins; the connecting rods are thus longer than is usual in this class of pump, and intermediate bows, etc., are dispensed with. The crank ends of the connecting rods are provided with gun metal marine steps, wrought iron plates, turned bolts, nuts, and lock nuts, the opposite ends being cut out of the solid and having gun metal steps, round and square, with taper cotter chased at top side, and having nuts and lock nuts for adjusting.

The cranks are of crucible cast steel, 4½ inches in diameter, and with a flanged coupling connecting the two, so that either pump may at any time be disconnected. Each crankshaft has two journals 4 inches in diameter, and straight pedestals with caps and double gun metal steps carried by fenders bolted on the sides of the pillars. The slide valves are of the ordinary flat kind, working in boxes cast with the cylinders and having Bessemer steel spindles.

The pump valves are of a tough rubber, working over grated seatings, under mushroom shaped guards, the valve boxes having a large area for the water. The suctions are separate (10 inch pipes), and the delivery valve boxes are connected together by a breeches pipe and delivered into a 14 inch pipe. The suction is from adjacent filter beds, and the delivery is up an incline 300 feet long and 25 feet high to the bottom of the water tower, and thence up the tower 85 feet high. The engines are calculated to deliver 50,000 gallons per hour when in ordinary work. The pipes are arranged that the pumps may deliver either on the top of the tower or deliver past the tower to supply the town direct.—*Engineering.*



IMPROVED COMPOUND PUMPING ENGINE.

UPON a slip of glass, says D. G. Doane in the *Microscopist*, put a drop of liquid auric chloride or argentic nitrate, with half a grain of metallic zinc in the auric chloride, and copper in the silver. A growth of exquisite gold and silver ferns will grow beneath the eye.

Is Hay Cheap Food?

Most dairymen suppose that hay is the cheapest food for their cows, and think it a misfortune to be short of hay—which is, in a sense, true, for every one should try to produce all the hay required for his stock—but it is seldom true that the market price of grain is higher than hay. If we consider the relative nutritive value of hay and grain, or product of grain, we find that good meadow hay or clover is no cheaper at $13 or $14 per ton than good wheat bran or middlings is at $20 or $21 per ton, or corn meal at $22 or $23 per ton, or linseed cake or meal at $32 or $33 per ton. Now, this does not mean that corn meal, middlings, or oil meal would be just as appropriate for the complete food of a cow as hay. We know that such concentrated food would be quite dangerous to feed a cow without some coarse fodder; but it means that the nutriment in these foods will be as cheap to make up any deficiency in the ration, at those prices, as hay at the price mentioned.

Therefore, when hay is dear in the dairy districts, instead of buying hay the dairymen should buy grain in some form to help him out. The grain will be cheapest, and his cows come through in much better condition for the milking season than if they had all the good hay they could eat. All a cow requires over twelve or fifteen pounds of hay should be made up in grain food. Twelve pounds of hay and eight pounds of middlings per day will winter a thousand pound cow much better than thirty pounds of hay per day. But the ground feed should be mixed with cut hay, moistened, so the ground feed will adhere to it, and must be eaten with the hay and raised, and remasticated. Fine feed, fed alone, is not raised and remasticated, but goes on to the fourth stomach, without further mastication.—*National Live Stock Journal.*

Electricity from Fire.

At the International Inventions Exhibition, Mr. J. A. Kendall, of North Ormsby, Middlesborough, exhibits an electric battery which appears to be a decided step in the direction of producing electricity from the oxidation of coal without the intervention of a steam engine. The battery is, says the *Engineer*, based upon the well known phenomenon of hydrogen passing through platinum at a red heat, two platinum plates being used as the poles, one exposed to hydrogen and the other to oxygen. These plates are arranged in the form of concentric tubes closed at one end, and are separated by a fluid medium of fused glass. Hydrogen gas is continuously supplied to the inner platinum tube, while the entire apparatus is maintained at a high temperature by means of a furnace fed with coke or liquid or gaseous fuel.

The absorption of hydrogen by the platinum is accompanied by electric generation, and the current is led away by wires connected with the platinum tubes. It is curious, however, that so long as the two platinum tubes are not connected by a metallic circuit, the passage of the hydrogen is slow, but that, as soon as the electric circuit is completed, the rate of flow is suddenly increased and is steadily maintained at the higher amount. In the case of a group of cells or battery, the same gas furnace may be used to heat the series. The cells are connected for quantity and intensity as in the voltaic battery. The electromotive force of a cell is given by Mr. Kendall as about 0·7 volt. This is, of course, much less than the theoretical electromotive force of a hydrogen and oxygen couple, and the remaining energy evolved by the combination appears to be developed in the form of heat at the surface of the oxygen plate, and serves to keep up the temperature of the apparatus. In the action of the battery, the hydrogeu in passing through the inner tube is, so to speak, filtered off from any gases with which it may be mixed. The residual combustible gases, if any, when drawn off by the escape jet, can be utilized as fuel for the furnace. This is a very valuable feature, as it enables the battery to be worked with Strong producer gas, consisting mainly of hydrogen and carbonic oxide, and to be arranged in a very compact way, the spare heat left from heating the cells being available for working the producer. Mr. Kendall proposes to employ it for a variety of purposes—for example, the driving of electric launches, and so on. With the new generator, all that is required to maintain the working is a supply of fuel and a little water. The inventor estimates that a ton of coke used in heating the battery, including the hydrogen producer, will give at least three times the electrical energy that would be produced by the same quantity of coke used in working a steam engine and dynamo. It is also hoped by the inventor to develop the new process of electric generation for lighting purposes. Houses can in this way be lighted by incandescent lamps by means of coal gas supplied to the premises; and larger centers of illumination could be economically worked by the use of ordinary fuel, such as coal and coke.