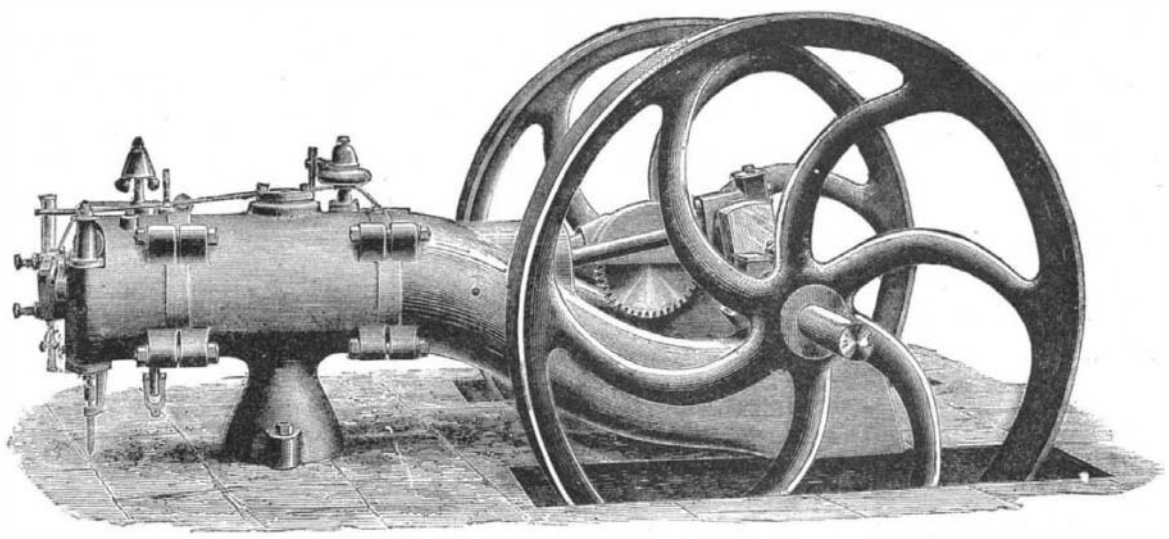
IMPROVED GAS ENGINE.

At the Electrical Exhibition, Crystal Palace, London, there are eight Crossley engines, namely, one 16-horse power nominal gas engine, indicating 40-horse power; three 12-horse power nominal gas engines, of 25-horse power each, indicating 75-horse power; one 8-horse power nominal gas engine, indicating about 15-horse power; one 3·5-horse power nominal gas engine, indicating 5·8-horse power; one 2-horse power nominal gas engine, indicating 3·9-horse power; one half-horse power nominal gas engine, indicating 2-horse power. The total indicated horse power is 141·7. The brake or effective horse power of these engines, when in good order, is stated to be about five-sixths of the indicated power. The 16-horse power engine is an entirely novel design, so far as the framing is concerned. We illustrate it herewith. The form is at once rigid, and most economical of material, while nothing can be easier to fix, nor depend less on the skill of the erector. This engine has also a new form of governor, in which, by changing the position of a link against the end of which a cam presses, the gas supply is varied by changing the period of admission. The air supply is nevertheless unaffected. This is a desideratum in Crossley engines. The principle of this new movement, which is simplicity itself, and yet is equal to varying the cut-off in steam engines, is also applicable to steam engines. If applied to them a separate small steam valve is put outside the slide casing, and on it the governor may operate in a manner analogous to that in which it operates on the gas valve. It is a form of governor arrangement which has the important advantage of offering no appreciable resistance to the governor itself, the work of moving the valve being done independently by the shaft of the engine.



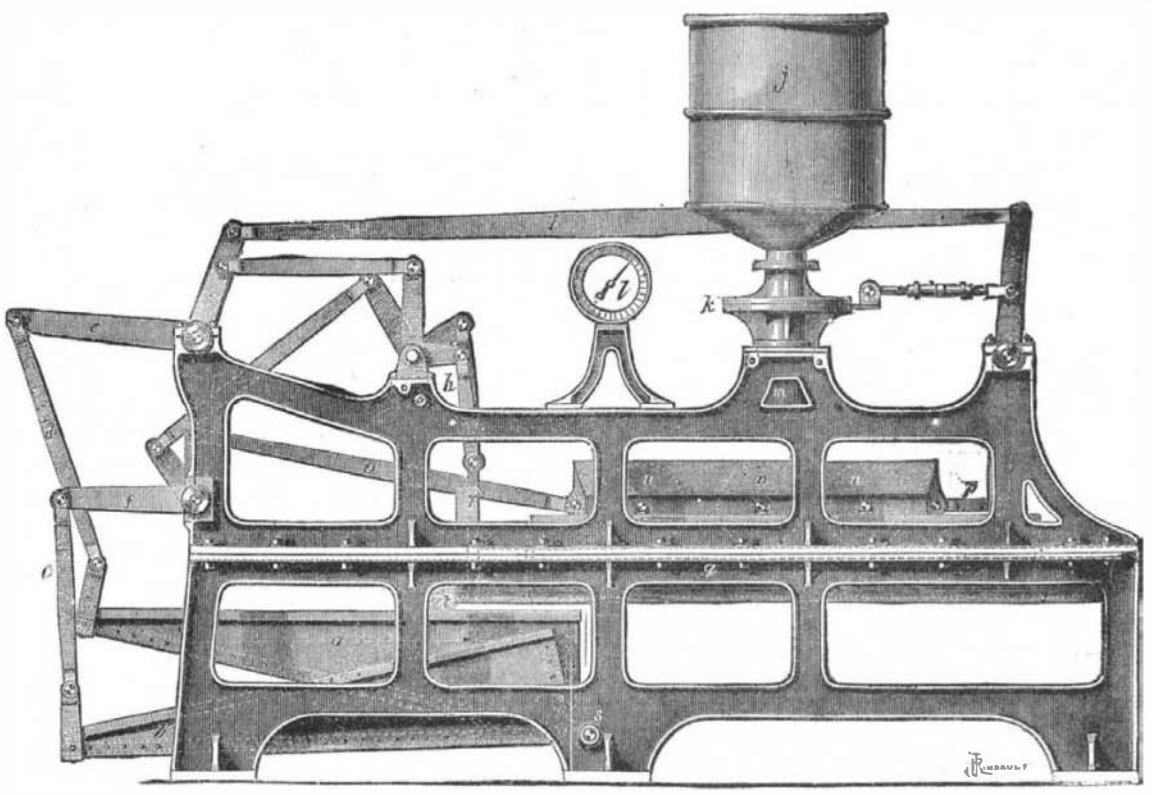
SIXTEEN HORSE POWER GAS ENGINE.

Everything about this engine is thoroughly substantial, durable, accessible, and, for the most part, even elegant in form. A small half-horse power nominal engine, which drives a number of Swan lamps, with a Siemens dynamo affixed to it on a suitable stand, forms a complete little electric plant, adapted for use in private houses, and is, we think, a very good little apparatus, and entirely novel, too, as a small installation.—*The Engineer.*

SEWAGE MACHINE.

The question of the purification and disposal of sewage has been tackled by a large number of enginecrs, chemists, and others, with a greater or less degree of success—more frequently less than greater. Mr. John Hanson's treatment consists in the use of lime and black ash waste as purifiers, and his system has been in use at Tong, near Bradford, England, for about four years with every success. It is also in use at other places, notably at Golcar, near Huddersfield, where the works were designed by Mr. Hanson and were started near the close of last year. The objection to lime alone, as stated by Mr. Hanson, is that lime alone does not remove the germs of infection, whereas with the addition of black ash waste the water is so effectually purified that, according to a report of the constable of the Tweed Commissioners, salmon fry and other delicate fish can live in the purified water. This black ash waste is a by-product from alkali works. According to Prof. Roscoe, for every ton of soda ash produced, from 1½ to 2 tons of waste are formed and accumulates in enormous quantities. This waste contains the whole of the sulphur burnt in the pyrites kiln, amounting to from 15 to 20 per cent of the weight of the waste. The purifying properties of black ash waste are as follows: Black ash waste as it comes out of the vat contains all the sulphur which was used in the making of the soda ash. It is then in the form of insoluble monosulphide of calcium. When the monosulphide of calcium is exposed to the action of the atmosphere it passes into a state of higher oxidation, then called disulphide of calcium. When this soluble disulphate of calcium is brought into contact with caustic lime, after both have been added to the sewage, then the disulphite of calcium contained in the black ash reacts upon the free caustic lime which is held in solution, and precipitates both in the form of monosulphide and sulphate, carrying down with them all the sewage impurities, thus discharging the effluent neutral and pure into the stream. By means of lime alone this is stated to be impossible. The two deodorizers are well stirred in the cistern by agitators, worked by a small gas engine. Into the lime cistern water is introduced to produce the necessary paste, and into the other the sewage runs by gravitation, and thus the effluent of each is a diluted fluid which is conducted into mixing and settling tanks. The tanks are emptied occasionally, the residuum being removed for use as a manure.

The chief feature of the machine, says *Iron*, is that it is worked by the sewage which is to be subjected to treatment, thereby avoiding the expense of skilled labor and fuel. Assuming the main sewer to be arrested, as it were, by this machine, its contents flow into a reservoir provided with a set of rollers which convert the lime and black ash to form the precipitate into a pulp. This is discharged into two trough levers beneath, which form the motive power for setting the whole machine in motion. A sufficient quantity of sewage having gone into one or the other of these troughs, it goes down, discharges its contents charged with the precipitating material, and in the action turns all the machinery that has ground the black ash and lime, and even registers the number of gallons of sewage that have passed. The invention is very simple. Every crank and lever is set in motion by one fall of the troughs, and it has not a wheel in it. Mr. Hanson calculates that for £500 such a machine could be erected which would clear the sewage of a town of 10,000 inhabitants. Of course, the great idea of treating sewage is to introduce the precipitating elements, to make it, in fact, innocuous; but this hitherto has only been effected at a great expense. Mr. Hanson's machine promises to make this a very simple matter.



MACHINE FOR PURIFYING SEWAGE.

Our engraving represents a side elevation of the apparatus. *a* and *b* are the water levers; when one is full of sewage water the lever drops and the empty lever rises, giving motive power to *c* and *d*, which are rods connected with levers *e* and *f*, and to the whole of the machine. The rods, *g* and *h*, are connected to sluices from which flow alternately the sewage water, Nos. 1 and 2, *a* and *b*. There is a lever bar, *i*, working the back part of the machine. The hopper, *j*, contains the black ash waste and lime or other chemicals for purifying purposes. A slide, *k*, is regulated to supply from *j* the given quantity of chemicals required to purify the quantity of sewage water contained in *a* or *b*. An indicator, *l*, is for registering the number of gallons of sewage water that pass through the machine. The chemicals fall through the tube, *m*, among the grinding rollers, *n*, by which they are crushed. The rollers are pulled forward by a lever, *o*, and backward by the lever, *p*. A sewage pipe, *q*, conducts the foul water to the sluice valves, *r*. The water levers, *a* and *b*, turn on a fulcrum rod, *s*. At *t* is seen the sewage water falling into the water levers.

It will, no doubt, occur to some that as the sewage is purer at night than during the day, the addition of the purifying material during the former period is so much waste. So thought Mr. Hanson, and he has devised an automatic arrangement whereby, as the sewage becomes purer, so the supply of purifying material is cut off until it ceases entirely. As the sewage becomes gradually foul in the morning the supply of the chemicals commences and continues. The mixture of sewage and chemicals will be led from the water levers into a series of settling tanks.

Lutorcine.

This compound is described in a sealed paper which the authors deposited in 1875, and which has now been opened at their request. Lutorcine is obtained on treating monobromated paracresylol with potassa. It crystallizes in very small colorless needles arranged in hemispheric masses. It melts at 104° to 105°, and dissolves easily in water, alcohol, and ether, but less readily in benzol and chloroform. It differs from orcine by its crystallization, its melting point, and its colored reactions. In presence of alkalies, lutorcine, on exposure to the air, takes a blood-red tint; acids turn this color to a yellow, but alkalies restore it. Chloride of lime gives a very intense and stable blood-red; potassium permanganate colors it also a bright red. With ferric chloride it takes a deep dirty green, and gives a reddish brown precipitate which does not contain iron. If treated with ammonia in presence of air it is converted into lutorceine, which has a brownish-yellow color, and is turned by acids to a pure yellow. This lutorceine dyes yellow.—*G. Vogt and A. Henninger.*

ENGINEERING INVENTIONS.

Mr. Henry A. Sessions, of Palestine, Tex., has patented an improved hand car in which the arrangement of the cranks and levers is such that the maximum amount of the power exerted upon the levers by the operators will be applied to the propulsion of the car, in other words, the object is to overcome largely the loss of power incident, through indirect action of the levers and unnecessary friction, to the common construction of car.

Mr. Thomas C. Steward, of Chattanooga, Tenn., has patented an improved car coupling attachment which is simple, convenient, and permits of coupling cars by means of the ordinary link and draw-head without requiring the operator to enter between the cars and endanger his life. This invention is an improvement on the car coupling attachment for which Letters Patent No. 236,855 were issued to the same inventor on the 18th day of January, 1881, and it consists of a bar or lever provided with an adjustable handle and pivoted to a collar loosely mounted on one end of a J-shaped bar attached to the end of the car, this bar being of such length that it can catch under the link of a draw-head and lift the link, so that it can enter the draw-head of the next car.

Mr. Henry Roth, of New York city, has patented a novel self-lubricating car axle box in which the concave or friction surface of the brass and the journal upon which the brass rests will be kept lubricated so long as there is any lubricant in the journal box. This end is accomplished by a peculiar arrangement of capillary conductors which constantly draw up and deliver to the journal the required amount of lubricant. The same inventor has patented a device for preventing the lubricant from escaping from the journal boxes, and preventing dust from entering them, also to facilitate the insertion of the lubricant.