sensitive adjustment for the jaws is provided by the knurled knobs, so that they cannot be forced down too tightly. At an extra charge special cases are provided for, so that the pad at the top of the rest can be planed and an angle bracket carried from this to attach to the wings of the carriage on the opposite side, to ensure great stiffness and rigidity. So arranged, the results obtainable on heavy bars from one of this company's high speed lathes, can be doubled over the results from the same lathe without such a rest.

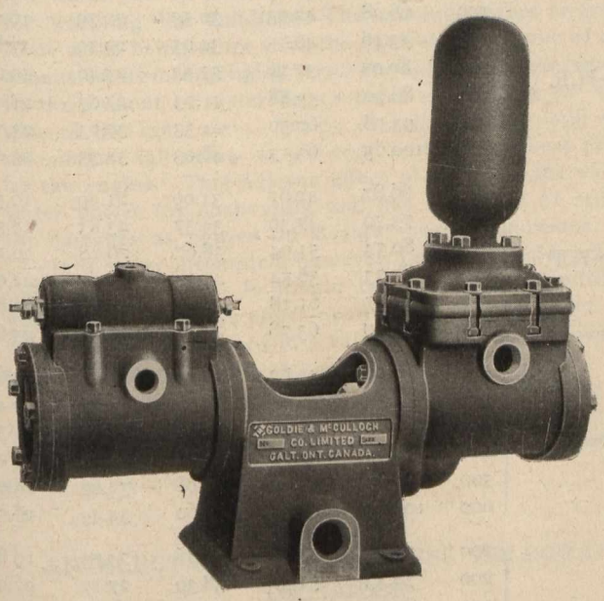
INDEPENDENT AIR PUMP AND JET CONDENSER.

We herewith give an illustration of an independent air pump and jet condenser, made by the Goldie & McCulloch Co., Limited, Galt, Ont. The exhaust steam from main engines, pumps, etc., is admitted into the top of the condenser, and on its descent is met by a fine spray of cold water coming in the opposite direction through a spray pipe. By this process a complete mechanical mixture of the steam and injection water is obtained. A vacuum is thus formed by the water depriving the steam of nearly all its latent heat and condensing it. The air pump removes the condensed steam from the condenser, the action being continuous. An automatic vacuum-breaking device is provided, consisting of a copper float and valve opening to the atmosphere.

Where water is available, a great saving of fuel or corresponding increase of power can be obtained by the use of one of these condensers. It is a well known fact that the atmospheric resistance, together with the back pressure in exhaust passages and pipes, is so much power taken from the steam on the engine piston. When the steam in an ordinary non-condensing or high pressure engine has performed its work in the cylinder, it is ejected into the atmosphere against atmospheric pressure, usually reckoned at 15 lbs. to the square inch.

The work of the condenser is to remove this back pressure and form a constant vacuum, equal to 13 or 14 lbs. per sq. in., on the exhaust side of the piston, and the steam can consequently be expanded to nearly the absolute zero of pressure, thereby obtaining its full expansive power. The use of a condenser will, therefore, cause a saving of from 20 to 25 per cent. or increase the power from 20 to 25 per cent.

An independent air pump and condenser has an advantage over a direct connected or belted air pump, as it can be started and vacuum obtained before the engine is started.



Another advantage with this condenser is that when a close heater of any pattern is already located, it need not be discarded, as it will act as a surface condenser between the engine and independent condenser and increase the temperature of the feed water so it can be returned to the boiler at a temperature of about 130 degrees. A single condenser can be used for two or more engines, pumps, etc., one or all of which may be stopped without interfering with the action of the condenser. This condenser will work as well with marine engines as with stationary, and it can be used as an independent bilge pump when necessary. No steam pump is required to lift its injection water. It will lift from any point that can be reached by pumps in general use. The water cylinder lining, stuffing boxes, gland and nuts are brass. The piston rod is Muntz metal. The valve seats are brass, but the valves are rubber with brass springs.

The Goldie & McCulloch Co., Limited, manufacturers of the above, issue interesting catalogues of both pumps and condensers, and would no doubt be pleased to send these to any one interested.

THE VALUES OF WATER POWERS AND DAMAGES CAUSED BY DIVERSION.*

BY CHAS. T. MAIN, BOSTON, MASS.

(Continued from last issue.)

Approximate Cost of Water Power Development.

In connection with the preceding diagram is printed a table showing approximately the cost per horse-power of water power plants, not including dam, canal and buildings, for different heads, distances from feeder to end of tail-race and horse-power of development.

It is not expected that this table will cover all cases, but it will give approximate figures for ordinary conditions, and is useful in making rough preliminary estimates.

Extra Length of Time Which Steam Plant Must Run on Account of Diversion.

If the power of the stream is worked out before and after diversion, it will probably be found that the auxiliary power plant must be run for a longer time after the diversion.

This would be shown in full months in the tables showing the power before and after diversion, but it would not show fractions of a month.

The method of ascertaining the extra length of time is to make a diagram in which the ordinates show horse power, which the whole stream can produce, and the abscissæ the number of working days. By plotting the horse-power which can be developed before and after diversion and drawing diagonal lines from month to month, the extra number of days when the auxiliary plant must run is shown where the diagonal lines cross the horizontal line of wheel development.

Steam or Other Power Plant to be Used in Making Good the Power Diverted.

In order to determine the damage it is necessary to estimate the cost of replacing the power taken away, not necessarily by the auxiliary plant already existing in the mill, for such a plant may be an extremely uneconomical one, and the mill which had the poorest plant would get the most damages, but by a fairly economical plant of the size

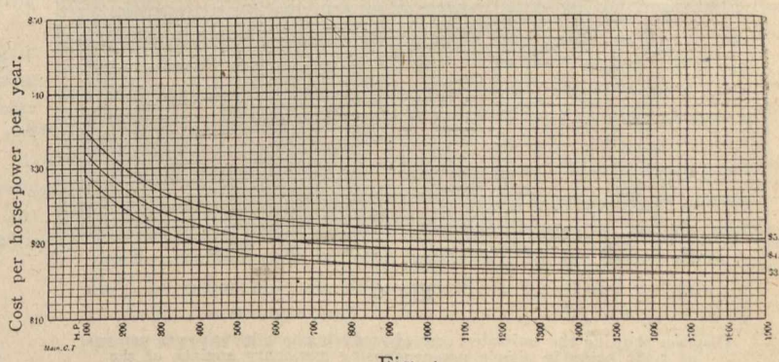


Fig. 4.

Diagram showing the estimated cost of producing one horse-power per year of 3,080 hours, in compound condensing engines of the capacity given, with coal at $3, $4, or $5 per long ton.

and character, such as the business under consideration would naturally use. Unless this method is pursued with a series of mills, the one which had put itself into the best shape would receive a smaller amount of damage than its neighbor where things were in bad shape.

*A paper presented at the New York meeting (December, 1904) of the American Society of Mechanical Engineers.