

VENTILATION IN ENGLISH MINES

USEFUL HINTS
ON
VENTILATION;

EXPLANATORY OF ITS LEADING PRINCIPLES,
AND DESIGNED TO FACILITATE THEIR
APPLICATION TO ALL KINDS OF
BUILDINGS.

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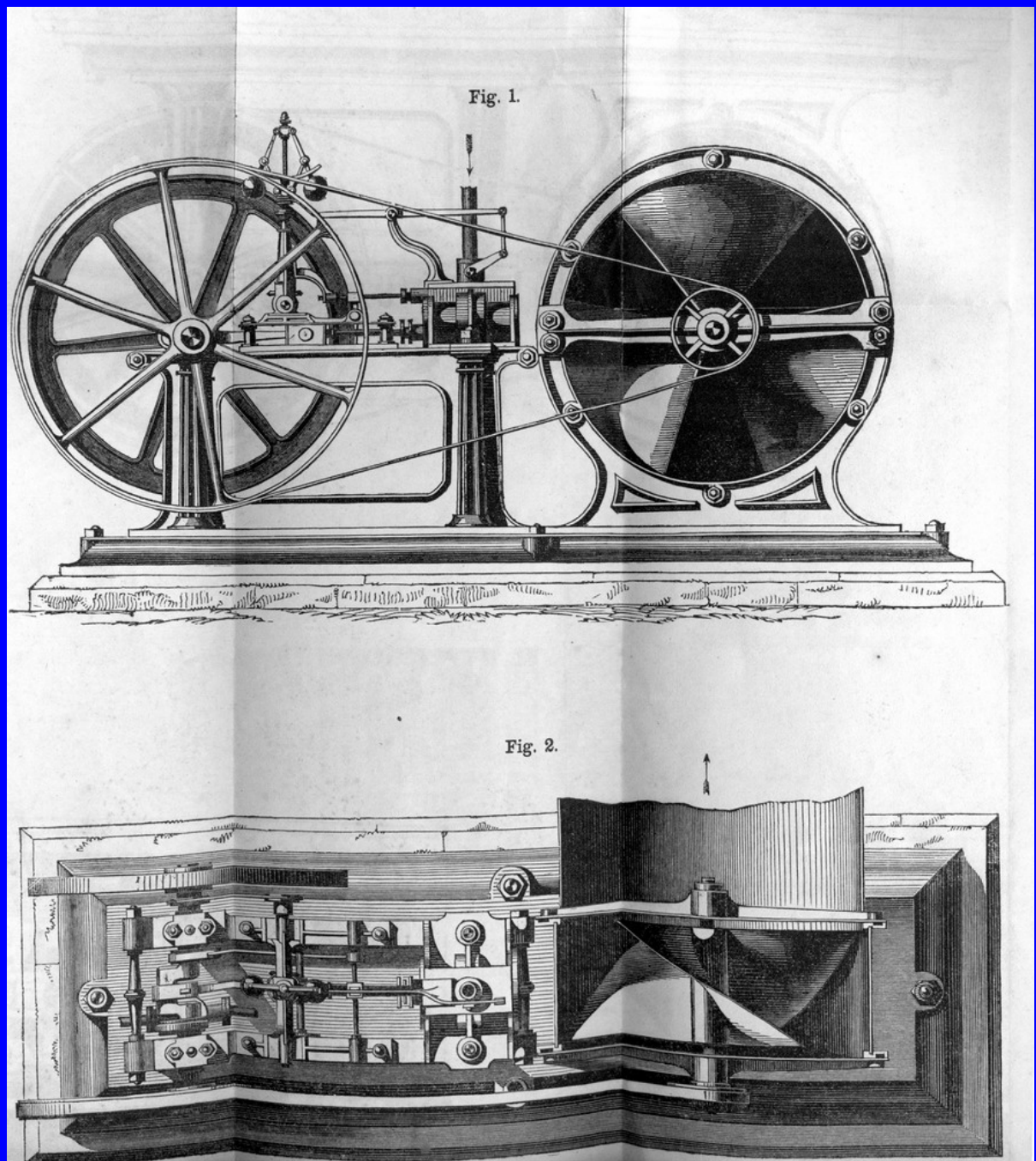
Another species of mechanical ventilation has been introduced by Mr. Gurney, by the injection into a shaft of small jets of high-pressure steam, which immediately expanding and filling the shaft, are carried up by the high temperature of the steam, which thus draws after it the air in the lower part of the shaft. This being connected with any system of egress-flues, insures their action by exhaustion, and will be found to answer well in many cases.

This steam-ventilator is in constant use at the Orrell colliery, near Wigan. A cylindrical boiler of 24 horses' power, twenty feet long, by six feet diameter, is set in brick-work in the usual manner above the ground near the mouth of the up-cast shaft, which is 900 feet deep. A pipe proceeds from this boiler down the shaft to a depth of 600 feet, where it turns off into a drift or passage sloping downwards, and leading into some of the

galleries of the mine. At a distance of 14 feet along this drift the pipe is divided into four smaller branches, each of which stands up across the drift, and is perforated with three apertures fitted with conical mouth-pieces. These mouth-pieces or jets (twelve in number) point upwards in a direction parallel with the floor of the drift, and are so spaced in their respective pipes as to be distributed equally over its entire sectional area. The boiler supplies steam at a pressure of 50 lbs. per square inch, which is considerably reduced before it reaches the jets by condensation within the pipe, which ought to be lapped. The steam issuing from these jets expands conically, the bases of the inverted cones of steam occupying space in the shaft, and acting on the air as pistons; the jets by their upward force also communicating motion to the air laterally, much in the same manner that a running stream of water communicates motion in the same direction to standing water in its immediate vicinity; or as the air in a chimney is drawn out and carried on in the same direction as the prevailing wind. (See figures of Chowne's air-siphon in a subsequent page.) Probably upward motion is also imparted to the air on the principle of continually-expanding concentric rings of steam curling over each other as they issue from the jets, and drawing air into the inverted cones of steam, whence it is driven onward as before described. These several causes combine with the high temperature of the steam in producing

an upward motion within the main shaft ; just as the steam discharged from the blast-pipe into the chimney of a locomotive causes a strong current of air to follow through the fire-bars. The above arrangement of steam-jets and general mode of ventilation has been also adopted at the Seaton-Delaval Colliery, near Newcastle-on-Tyne.

From data kindly supplied by Mr. G. Gilroy, viewer of the Orrell colliery, the absolute effect produced by this arrangement, as indicated by the anemometer, amounts to 46,143 cubic feet of air passed through the mine per minute, being equal to 1922.6 ft. per horse per minute. This result, taken in connection with the power required to produce it, is considerably below that which has been obtained by the writer with a double-action air-pump, which passed upwards of 13,000 cubic feet per minute with a power of four horses, being equal to 3,250 ft. per horse per minute. The difference may probably be owing to the more indirect action of the steam-jets upon the air, which can hardly be expected to operate with the same efficiency as when the expansive energy of steam is confined within a cylinder, and concentrated upon a piston fitting closely into it, as in the steam-engine ; but before any just comparison can be made, more precise experiment must be instituted. The avoidance of all machinery on the steam-jet principle is an argument in its favour in many cases.



Typical Archimedean screw fan