DENNIS' PATENT STOP VALVE.

On page 60 we illustrate a stop valve, the invention of Messrs. Dennis, of Chelmsford, which almost explains itself. In the valve-box are fitted two short racks at opposite sides of the box, as well as at opposite ends. The valve consists of a central portion with an internal screw at each end, and of two discs toothed at the edges to take into the teeth of the racks to which we have just referred, and of a screwed boss which enters the central portion of the valve. By raising and lowering the central portion it is obvious that the discs will be caused to rotate, as they approach the bottom they are by this rotation screwed further apart and made to fit tight against the internal faces of the valve-box, so as to be quite tight. The slightest upward motion starts the valves from their seats, and allows the utmost freedom of motion. This appears to be a very ingenious valve, likely to prove exceptionally useful under many conditions in hydraulic work.

A WATER BELT FOR TRANSMITTING MOTION.

A curious mode of transmitting motion by means of a water belt is represented in the engraving on page 60, which we extract from the *Revue Industrielle*. The device is that of an English inventor, Mr J. Robertson, and is said to work with perfect freedom from noise and vibrations. The piston of the engine is connected with the driving shaft A, on one extremity of which is attached a large hollow pulley B. The outer face of the latter is cut away from the center so as to leave only a flange of the width shown at *b*. Through the opening passes the shaft of a fan blower D, on which, and inside the hollow pulley, is a pallet wheel C. The pallets on the latter do not touch the inside of the hollow pulley.

In operation the water *a*, of which a small quantity is placed in the pulley B, is caused, by centrifugal force, to spread itself against the inner periphery, and to be carried around with the wheel. Into this water, as shown in the sectional view on the left, the pallets on wheel C, dip, and are thereby acted upon by the force of the same, causing the wheel C, to rotate. The hollow pulley is of sheet iron, and is revolved at the rate of 500 turns per minute. No water whatever, it is stated, is ejected from the apparatus, and it is only necessary to supply the small amount lost by evaporation to keep the device in working order.

HALL'S VICE.

We publish on the previous page, a perspective view and a section, showing the arrangement of an ingeniously devised vice, designed by Mr. Hall, of New York. With the help of the section the construction of the tool will be clearly understood. The fixed jaw is shown at *c*, and is cast in one piece with the rectangular hollow block, through which the movable jaw and its parts slide, and terminates in a disc, with a dovetailed circular recess, as shown at *c1* and *c2*. The bedplate of the vice is circular, and dovetailed, to fit the similarly-formed recess in the stock of the fixed jaw. This bedplate is made in two pieces, as shown at *a a*, and a sufficient space between is left in the centre to set them in place easily; they are then tightened up by a slightly tapered steel key, but this is not driven so tightly as to prevent the free movement of the stock *c1 c2* round its dovetail.

The forward end of the movable jaw *d* is provided with a circular block *e1*. This block consists of two discs, connected by a saddle piece *e3*. This is all cast in one piece, and is of such a width as to fit between the parallel sides of the U-shaped sliding piece which forms the continuation of the movable jaw *d*, and the form of which is clearly shown in the perspective sketch. This block is fastened in its place by two straps *e2*, each of them the width of the disc *e1*. The straps are fastened by a screw to the under-side of the sliding block, and at the top they are hooked over a small pin, as shown. A lever is attached to the saddle piece *e3*. By depressing this handle, as in the perspective view, two effects are produced. First, the vice—which, when the lever is horizontal, is free to turn—is locked, and, second, the object put in the vice is firmly gripped. These results are obtained as follows: A small pin *k* extends between the two discs *e1*. Bearing against the underside of this pin is shown one end of a lever *j*, the other end of which engages under a piece *h*, of the form shown in the section. Another pin *f* is also placed between the two discs. To it is attached a long wedge bar f_1, parallel as far as the small projection, shown inside the top of the sliding block. A strong abutment d_1, bridges the space between the sides of the sliding block. Outside this is a light spiral spring h_2, acting always against a tall piece formed on *h*, and of sufficient strength to retain *h* in the position shown, providing there is no opposing effort. Resting on the bedplate *a* is a rack bar *i*, with teeth corresponding to those of *h*. On depressing the lever *e* the pin *f* is drawn back, and pulls the enlarged end of the bar f_1 along with it. At the same time, as the pin *k* rises it ceases to hold the lever *j*, which then no longer prevents the teeth in the piece *h* from locking in the rack teeth. As the bar *f* is drawn back the enlarged end has to pass between the small projection inside the top of the sliding block and the toggle lever *g g 1*, the effect being to depress the latter, and to set up a powerful locking action on the jaws of the vice. At the same time *h* is pressed down, and, entering the teeth of *i*, seizes the stock *c2* upon the bedplate, and checks all further movement in this direction. The vice is so arranged that no dirt can enter it, as the tail piece of *h* and the lever *j* are wide enough to fill the space between the cheeks of the sliding block, and the opening under the disc *e1* may also be closed.

A NEW JOINT.

A method for making joints to unite the sides of boxes and other matters has been recently patented by Mr. W. M. Beaufort in England, France, Belgium, and the United States, through the agency of Messrs. L. de Fontainemoreau & Co. The joint is made with great speed and with little labour.

The two pieces of wood to be fastened together are first mitred in the usual manner, and a hole is then drilled (preferably by a drilling machine) vertically in each piece, from the bottom upwards, at a short distance from the mitred edge as seen in Fig. 1. A channel or groove is then cut by a circular saw or otherwise, from the mitred edge to the drilled hole. This channel is of a less width than the diameter of the hole, and may be cut either parallel to the sides of the piece of wood, as in Fig. 2, or at right angles to the mitre, as in Fig. 3, so that when the two pieces are but together a continuous channel shall be formed between the two holes, as seen in Figs 4 and 5. The two pieces are then held tightly together, and a key is formed by running metal, such as lead or "fusible metal," in the molten state into the channel; by this means, the key, which is to bind the two pieces together, is cast in the place which it is to occupy The key may also be made separately, of solid metal, as seen in Figs. 6 and 7, and driven home into the prepared channel. The invention is likely to be useful.

HOWARD'S SAFETY BOILER.

Among the novelties exhibited at the meeting of the Royal Agricultural Society at Bedford, was a new type of safety boiler by Messrs. J. and H. Howard. We publish, on the present and opposite pages, engravings of this boiler which will enable us to explain its peculiarities fully. As will be seen from the views we give, the boiler is, like the former Howard boiler, composed of wrought-iron tubes 9 in. in diameter externally, these tubes being connected together in groups and being placed at a slight angle to the horizontal, the several tubes of each group lying one over the other. It will be remembered that in the horizontal tube boiler, until lately made by Messrs. Howard, the tubes of each group were connected at but one end only. In the new type, however, connexions are provided at both ends, a decidedly better arrangement. The manner in which the connexions are made we will now proceed to describe.

Referring to the engravings, and particularly to the detail views on page 64, it will be seen that each tube has fixed to it at each end a cast-iron cap or chamber. The manner in which these caps are fixed to the tubes is somewhat peculiar. Around each wrought-iron tube, at each end, is