down by radiation (external) and by convection to the condenser (internal); the piston cooled down by convection only; so much of the cylinder as is uncovered during this portion of the stroke; and re-evaporating all the water found between the cutoff valve and the piston. The water is evaporated during the first instant of admission, and doubtless is, in part at least, re-deposited again before the valve closes, through the agency of the chilled metal; and the fact is that the cylinder contains on the steam side at the moment the cut off valve closes nearly three times as much steam and water as the boiler should theoretically supply in the form of steam alone, and it is the partial reevaporation of this water which feebly compensates for a portion of the loss during the remainder of the stroke.

In the high pressure non-condensing engine the vapour present within the cylinder can never fall below 212 deg., and this fact will go far to account for the circumstance that the comparative advantage to be derived from the condenser falls short of that deduced from theoretical investigation. When steam is super-heated moderately we find that the cylinder is always maintained at too high a temperature to permit the deposition of moisture, and thus there is a direct and considerable gain over and above that derived from the increased efficiency of the boiler. We have not dwelt on the influence of external radiation or on that of the clearance spaces. It will easily be perceived, however, that clothing or jacketing a cylinder is comparatively useless while the ends or lids are left unprotected. Clearance operates most injuriously with the higher measures of expansion, and it should therefore be invariable reduced to the lowest possible limit compatible with safety. A cylinder 32 in. stroke and one square foot in area, expanding the steam eight times, should receive, apart from condensation, but 576 cubic inches of steam ; but we must add for 5 in. clearance space, one-eighth of this quantity, or 72 in., and if we include the space between the cut-off valve and the cylinder, the whole amount will hardly fall short of one-fourth of the entire quantity supplied. The loss from this cause alone frequently amounts to as much as 20 per cent. of all the steam supplied from the boiler.-Mechanics' Magazine.

## DEVELOPMENT OF COLONIAL RESOURCES.

## Sawing Machinery.

Perhaps there are few countries in the world so well provided with timber suited to the purposes of man as New South Wales, and certainly nowhere until within a very recent period was so little effort made to turn natural capabilities to account. Three or four years ago almost all the window sashes, doors, flooring, and other carpenters' and joiners' work used in the colony were imported, as well as most of the ordinary articles of furniture and cabinet-maker's goods. Now, on the contrary, owing to colonial enterprise and ingenuity, almost every article of this kind is made in Sydney, and at a much lower price than it can be imported for. Two years since the market was glutted with imported doors, sashes and furniture, since then no articles of the former description and very few of the latter have been introduced; and

owing to the adaptation of machinery to cabinetmaking and carpeutry, there does not now exist the slightest chance of the revival of such an anomalous state of things, as a colony producing the finest timber in the world, importing inferior articles manufactured from inferior timber, from a country thousands of miles distant. It is all the more gratifying that this change has been brought about, not by absurd protective duties, not by excluding by legislative enactment the products of the industry and commerce of other countries, but by colonial energy and capital acting in open competition with the world; and, for that very reason, certain to be more permanent in its effects and successful in its operations.

We think it due to those to whom the colony is mainly indebted for producing the beneficial change alluded to, that attention should be drawn to their efforts; and we feel sure that a notice of the machinery used, and a description of the process by which a log of wood is changed into doors, bed-steads, or packing cases, will be read with interest

There are are several establishments in Sydney for machine-sawing and the manufacture of woodwork, but by far the most extensive is that of Messrs. Moon & Co., at the foot of Bathurst street, and to a description of this we shall at present confine ourselves. The premises occupied in the operatons of this firm covers several acres of ground, and the number of persons in their employ-ment is upwards of 150. Their machinery is driven by three steam-engines, and all their engineering and machine making is done on the premises. Most of the machines used were not only made under the direction of Mr. Nicolis, their engineer, but several of the most important are of his own invention. To understand perfectly the operation of the various mechanical appliances, it will be necessary to watch the progress of a log of wood-say of cedar or pine, for nearly all the timber used is the produce of the country-from the time it is drawn from the water at the foot of Liverpool street, until it is changed into chairs, bed-steads, and tables, ready for the purchaser. The log of timber is drawn from the water up an inclined plane, and placed on the moveable frame of an engine, called a breaking-down machine. This is the invention of Mr. Nicolls, and is one of the most powerful sawing machines in the world. It is remarkable for the simplicity of its construction, and works very much on the principle of Nasmyth's steam hammer. The blade of the saw is a mere extension of the piston-rod, so that its action is perfectly direct. It is capable of sawing a log eight feet in diameter, with as much ease as a man would cut with a handsaw through a plank of an inch in thickness. After being broken down, as it is called, by this machine, the timber is sawn into thinner portions by other more complicated ones. For this purpose there are two perpendicular sawing machines, each capable of carrying from eight to sixteen vertical saws, according to the required thickness of the planks. . The perfect truth and smoothness with which these machines turn out their work is admirable. We may remark that it is necessary that wood intended to be planed, grooved, tenoned and morticed by machinery, should be perfectly square and true, and