

## ENGINEERING INVENTIONS.

An improved safety valve has been patented by Mr. James W. Young, of Louisville, Ky. The objects of this invention are to obviate the difficulties connected with safety valves of usual form, in respect to limited area of valve opening, failure to open when the maximum pressure is reached, and closing of the valve before the pressure is sufficiently reduced. The invention consists in a steam cylinder and weighted piston combined with a valve or valves hung on a lever, whereby the steam, acting directly upon the piston, opens the valves by moving the lever.

An improved apparatus for amalgamating gold and silver ores has been patented by Mr. Robert A. Nevin, of Silver Cliff, Col. The object of this invention is to make an improved combination of known devices, whereby the ores of the precious metals may be amalgamated at less cost and with greater saving of the metals.

Mr. James Seath, of Terre Haute, Ind., has patented a very useful improvement in car axle boxes. This invention relates to axle boxes for car trucks which have covers sliding in grooves or ways formed on the face of the box, and it consists in a combination with such an axle box, having an inclined front face and a projection at its upper edge, of a cover having its lower edge curved under and forming a lip. This construction prevents the removal of the cover while the parts of the truck are in working position. The cover also is so constructed as to form a tight joint without the use of springs.

## IMPROVED POCKET KNIFE.

The engraving shows a knife, the blades of which can be easily removed and others inserted, and which, when not in use, will be convenient and harmless, it being impossible for the blades to open in the pocket, and when in use will be held firm and rigid. The handle consists of a hollow case, open on top and provided with a cover or lid hinged the length of one side, and fitting down upon the top, which is cut out to receive it and allow it, when closed, to lie flush with the ends. A nail notch or socket is provided for opening the lid to be readily opened. The ends of the case are provided with openings of sufficient size to permit the blades to project through them. These blades are contained within the case, which is fitted with partitions as in any ordinary knife. In the lower part of these spaces, on the sides of the case, are the flanges or ribs over which grooves in the heads of the blades fit and slide, thus keeping the edges of the blades from coming in contact with the bottom of the case, and preventing them from falling out when the knife is inverted.

The base or head of the blades on the upper side has the lugs or pins to allow the nail to get hold of and push the blades out. When the blades are in position it is retained by the cover.

In this knife there are no pivots in the blades, which in ordinary knives become loose and render the blades useless. No dirt can get in the knife, and the blades can always be



IMPROVED POCKET KNIFE.

pushed out ready for use, and when worn out or broken can readily be removed and others inserted.

Fig. 1 shows the knife ready for use; Fig. 2 is broken away to show internal parts; Fig. 3 is a transverse section, and Fig. 4 is a detail view of one of the blades.

This invention was lately patented by Mr. A. Kayser, of San Francisco, Cal.

## IMPROVED BOOK REST.

The engraving shows an improved book rest recently patented by Mr. Joel Swartz, of Camden, N. J. The fixed hollow standard is of iron, and the movable rod which is fitted to it supports one or two tables or rests. In the case illustrated there are two. These rests are each composed of



SWARTZ'S BOOK REST.

four leaves hinged to a central board and supported at any desired inclination by means of the brace rods pivoted to the adjustable sleeve on the standard. Each folding leaf is provided with a spring clip for holding books or papers.

The rest may be turned upon its standard, rendering the device very convenient for office or library use.

## On Sulphurous Acid Considered as an Oxidizing Agent.

BY MR. ANTONY GUYARD (HUGO TAMM).

Sulphurous acid is always considered with good reasons, and employed with equally good reasons, as a reducing agent; and although in a well known classical reaction sulphurous acid acts as a powerful oxidizer (namely, by transforming instantaneously the hydrogen of sulphureted hydrogen into water, with deposition of sulphur, as indicated by the formula,  $2\text{H}_2\text{S} + \text{SO}_2 = 2\text{H}_2\text{O} + 3\text{S}$ ), yet this reaction has never been considered as one of combustion or oxidation in the ordinary sense of the term, but rather as a double decomposition.

The writer wishes to call the attention of chemists to the fact, which he has discovered, that sulphurous acid used in the conditions in which it is employed for the reduction from the maximum to an inferior or to the minimum degree of oxidation of metals possessing two or several degrees of oxidation (namely, in the form of solution or of a stream of sulphurous gas passing through solutions of the metal to be reduced) acts also in certain cases as a powerful oxidizing agent, and that this reaction may prove useful to analysis. This is best demonstrated in the following manner:

A solution of protochloride of tin in a moderate state of concentration, such as would be used in the course of an ordinary analysis, is brought to boiling point, and a stream of sulphurous acid gas is passed through it, or a solution of this acid is added to it. After a very few minutes sulphur is deposited, and the whole of the protochloride of tin is transformed into perchloride.

The characteristic action of sulphureted hydrogen on the two chlorides of tin may be brought to play in order to leave no doubt as to the nature of the reaction that has taken place.

The writer feels confident that protochloride of antimony would act in the same manner, and as arsenious acid is not acted upon by sulphurous acid, and as, on the contrary, arsenic acid is reduced to the state of arsenious acid by this substance, the writer expects that these reactions will be applied to analysis in cases in which it would be advisable to possess, in one and the same liquor, arsenic in the minimum and tin and antimony in the maximum state of oxidation.

The reaction of protochloride of tin on solutions of sulphurous acid is thus interesting in itself independently of

the interpretation to which it may be subjected; for if, on the one hand, sulphurous acid may be considered as a powerful oxidizer of protochloride of tin, on the other, protochloride of tin may be said to reduce energetically solutions of sulphurous acid.

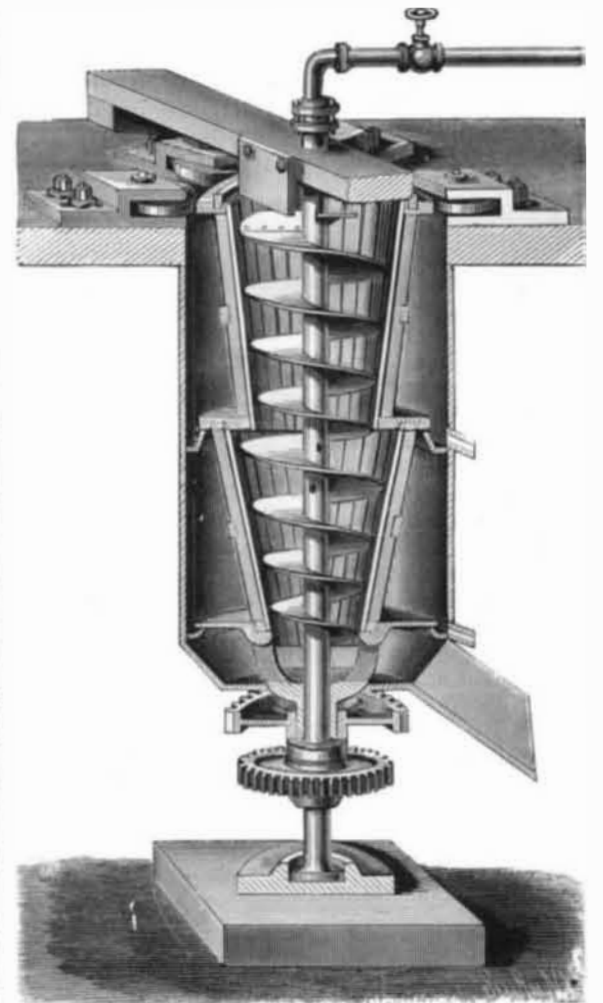
## CENTRIFUGAL EXTRACTOR FOR CANE JUICE.

The machine has a vertical shaft with its upper bearing in a box secured to a suitable frame, and its lower bearing in a step secured to the foundation. This shaft is tubular, and its upper end has a stuffing box for admitting the end of a pipe having a stop valve.

The revolving screen consists of substantial ribs of T iron properly bound together and arranged at such a distance apart that there are narrow openings between them. The upper end of the screen is properly secured to a ring placed between rollers, the rollers serving to support the upper end of the screen as it revolves concentric with the shaft. The lower end of the screen rests in and is secured to the ring of a casting connected to the hub of the casting by a number of arms. This screen-supporting casting can turn independently of the shaft, and is driven by differential gearing from the shaft. The revolving screen is placed in a casing having three outlets, two being for the discharge of the extracted juice, the third or lower one being for the escape of waste cane, or bagasse.

In treating sugar cane for the extraction of the saccharine juices, the cane, cut into small lengths, is fed into the top of the screen, and under the influence of the spiral flange of the revolving shaft the cane is fed downward until the whole space within the screen is tightly packed with the cane. As the cane descends it must necessarily be subjected to a continuously increasing pressure, due to the gradual contraction of the upper portion of the screen. The cane, under this pressure, yields its saccharine juices, which, by centrifugal force, are discharged through the spaces between the ribs forming the screen, the juices striking against the interior of the casing and passing from the latter through the outlet into any suitable receptacle. As all the juices may not be extracted from the cane when it has reached the first contraction in the screen, water is discharged from orifices in the tubular shaft at this point, where the screen is enlarged, so that the cane, after passing through the contracted upper portion of the screen, is saturated with water, and the enlargement of the screen permits the mass of cane to expand and absorb this water, after which it is again subjected to gradually increasing pressure, and the water is extracted, carrying with it the juices which it has washed from the cane, the combined water and juices being expelled by centrifugal force and passing through the outlet.

The waste cane, or bagasse, passes from the lower end of the screen between the arms that support the lower ring, and thence through the outlet. The speed of the screen must be determined by the centrifugal force required to dispose of the juices extracted by the pressure due to the spiral



BURGESS' CENTRIFUGAL EXTRACTOR.

flange of the rotating shaft; but there must always be such a difference between the speeds of the screen and that of the shaft that, while the former discharges the juices by centrifugal action, the latter exerts a downward pressure to extract the juices from the cane.

This invention was recently patented by Mr. H. Burgess, of Roger's Ford, Pa.