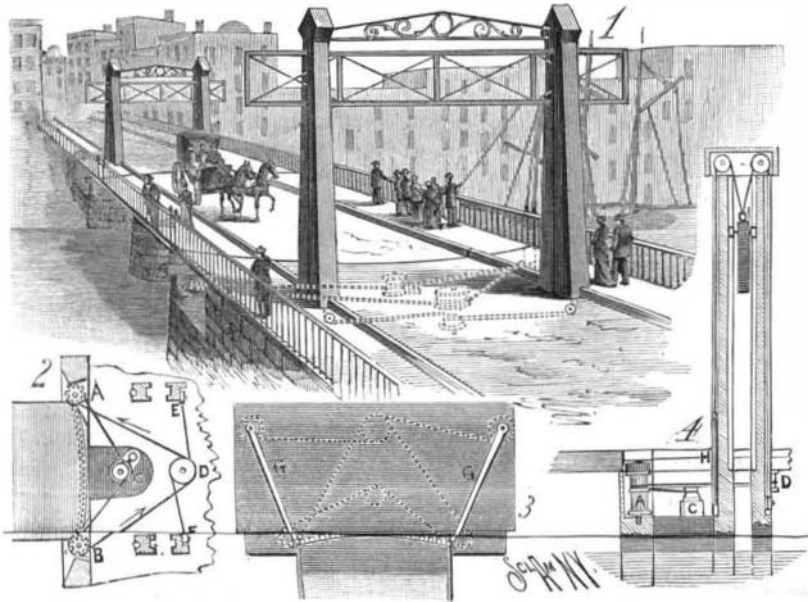


**DRAWBRIDGE GATE.**

This gate is so arranged as to be automatically moved to close the roadway when the bridge is opened, this closing being effected irrespective of the direction in which the bridge is moved. On each end of the bridge is a circular rack, engaging with pinions, A B (in the plan view, Fig. 2), mounted on vertical shafts stepped in the bulkhead. These shafts also carry drums, shown in Fig. 4, back of which is a double drum, D, and a



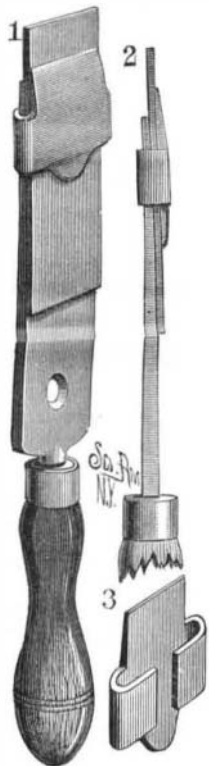
**QUATERMASS & ELLSWORTH'S DRAWBRIDGE GATE.**

guiding sheave, C, carried by an adjustably mounted bracket. An endless wire rope or chain passes around these drums, as shown in Fig. 2. The gate slides in slots in two posts mounted upon either side of the roadway. Two ropes, secured to opposite sides of the drum, D, pass under sheaves, E F, at the bottom of the posts, thence over sheaves at the top of the posts, and have their ends attached to the gate, which is provided with suitably arranged counterweights.

It is evident that, no matter in which direction the gate may be moved, the pinions will be rotated so as to carry the rope in the direction indicated by the arrows, so that the drum, D, will move to unwind its chains and permit the gate to move down. Appropriate stops prevent the gate from being lowered beyond a certain point. Fig. 3 represents a modification, in which the barrier closing the road way consists of two swinging arms, G, carried by vertical shafts having drums mounted upon them. The illustration clearly shows the manner of operating these arms.

This invention has been patented by Messrs. R. Quatermass and H. R. Ellsworth, of Moline, Kansas.

**SCRAPING TOOL.**



Secured to a suitable handle is a bar of uniform width throughout its length, but diminishing in thickness from the end next the handle. Fitted to the bar is a clamp, shaped as shown in Fig. 3. The thin end of the bar is inserted between the arms and body of the clamp and a hardened and tempered scraping bit is placed between the clamp and the bar. When the latter causes the clamp to draw tightly against the bit, which is held firmly in position for use. By means of this improvement, the bit may be made of uniform temper throughout its entire length, and may be moved forward as fast as it is worn away by grinding. In addition to the advantages secured by the adjustment of the scraper, this construction gives a peculiar elasticity, which causes the scraper to work smoothly.

This invention has been patented by Mr. James Wright, of Torrington, Conn.

**STEAM TRAVELING CRANE.**

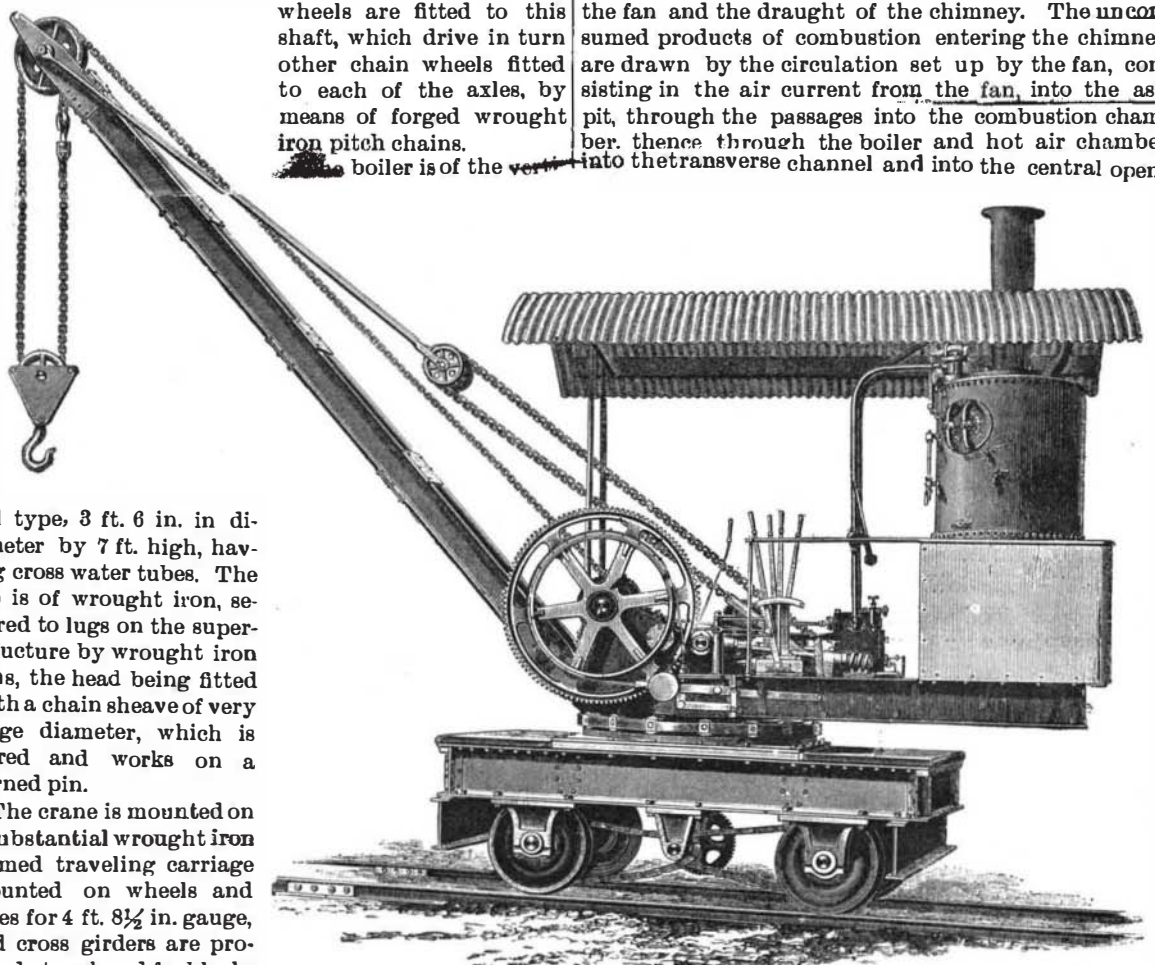
The steam traveling crane forming the subject of illustration, by Henry J. Coles, of 89 Sumner Street, Southwark, is shown at the Liverpool Exhibition. It is of five tons power at a radius of 16 ft., lighter loads being raised at proportionately greater radii. The crane has two steam cylinders, each 7 in. in diameter by 10 in. stroke, fitted with an improved form of reversing motion. The lifting gear is single purchase, of the proportions of about 8 to 1; and as the steam cylinders are of ample area, a quick speed of lifting is attained without running the engines at an excessive

number of revolutions. The hoisting pinion is fitted on a long steel feather on the crank shaft, and is made to slide out of gear when lowering by the brake. The main hoisting wheel is keyed to the barrel shaft by a sunk steel key, and has cast to it a strong brake ring. This ring is turned and fitted with a powerful wood-lined strap brake, capable of holding the maximum load suspended, and worked by a suitable lever from the foot plate. The chain barrel is 12 in. in diameter, of great width, having turned flanges; and for any ordinary depth of working it coils the whole of the chain without a lap. The maximum loads are raised at a moderate speed, using the snatch block and return chain. A very quick speed for loads up to about 2½ tons is obtained by working in single chain only.

The crane revolves completely round in either direction by steam power without stopping or reversing the engine; and an improved arrangement of loose slewing rack is placed between the upper and lower portions of the crane, which prevents all risk of breakage to the gearing, should the crane be started or stopped too suddenly. The friction cones, which transmit the power from the engines for the revolving motion, are fitted to a shaft running in wide gun metal bearings having loose caps and lock nuts. This shaft is bored up, and has passing through it a spindle fitted at the end with a cotter, this cotter being fitted to the female clutch and held by the spindle. A collar is formed at the outer end of the spindle, which runs in a circular box having phosphor-bronze friction washers on either side to take the thrust of the friction cone. The circular box is attached to a screw working in a suitable nut, so that by merely turning the box in either direction the female cone clutch is worked to correspond, and the rotating motion is imparted to the crane. This method of actuating the cones has been in use in these cranes for some years, and was adopted to obviate the great wear and tear which occurs in the case of a ring either wholly or partially encircling the clutch.

The radius of the jib is varied at pleasure by means of steam derrick motion worked from the crank shaft by suitable bevel gearing driving a steel worm and tangent wheel. The wheel is fitted to the derrick chain barrel, and securely holds the jib locked in any position.

The crane also has its own propelling power for traveling on the rails. The center pin is bored up, and a steel shaft passes through it, having bevel gearing fitted at the top driven from the crank shaft, with a pinion at the lower end gearing into a bevel wheel fitted to a shaft running in separate bearings under the traveling carriage. Chain wheels are fitted to this shaft, which drive in turn other chain wheels fitted to each of the axles, by means of forged wrought iron pitch chains.

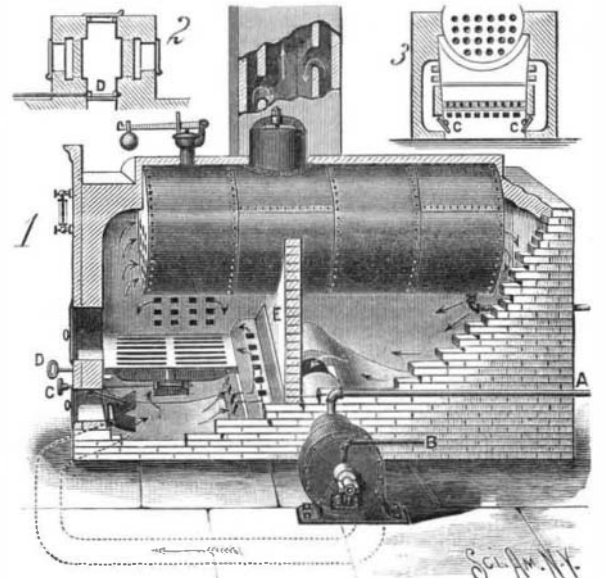


**IMPROVED STEAM TRAVELING CRANE.**

maximum load sideways. The total weight of the crane in working order is 16 tons.—*Engineering.*

**FURNACE FOR STEAM BOILERS.**

The object of the invention herewith illustrated is to provide a furnace for steam boilers, in which a complete combustion of the fuel is accomplished by introducing a mixture of steam, hot air, and gases into the fuel. The bridge wall at the inner end of the grate bars is provided with a partition wall, E, which divides the furnace into two main compartments—the combustion chamber over the grate and the hot air chamber under the rear of the boiler. In the bridge wall are several flues which begin under the grate and open into the combustion chamber, as represented in Fig. 1. In the side walls are other flues, Fig. 3, leading from the ash pit to the combustion chamber; these are furnished with dampers. Into the bottom of the ash pit opens a flue which leads to a mixing apparatus placed at the outside of the wall, and connected with the hot air chamber and with the



**HASECOSTER'S FURNACE FOR STEAM BOILERS.**

chimney by a transverse channel through the bridge wall. Into the mixing apparatus, consisting of a fan rotated in any convenient way, opens a pipe, A, admitting steam; an opening also provides for the admission of air from the outside. The heating of the journal box is prevented by cold water admitted through the pipe, B. The transverse channel is provided at its entrance to the chimney with a damper, D, shown in the plan view, Fig. 2. On the three outer sides of the chimney are doors, one of which leads directly into the central chimney opening, while the others connect with vertical side flues, which communicate with the central openings through apertures, Fig. 1.

The heat of the fire enters the front end of the boiler flues, and, passing through them, enters the hot air chamber, from which it is drawn up the inclined bottom into the transverse channel by the suction of the fan and the draught of the chimney. The unconsumed products of combustion entering the chimney are drawn by the circulation set up by the fan, consisting in the air current from the fan, into the ash pit, through the passages into the combustion chamber, thence through the boiler and hot air chamber into the transverse channel and into the central open-