tied together, using ¾ in. rods with clamp plates or ¾ in. U rod and plate as shown, and blocking at ends and along sides of hardwood not less than 4 by 8 ins., joined and bolted to car floor by either of the methods shown in fig. 66-C."

The two new figures referred to in new rule 122-A should be inserted in the code, immediately following fig. 66 and ahead of fig. 66-A.

RULE 124.—We have had some correspondence in reference to some modifications in the latter part of this rule, referring to the necessity for protection strips being placed in the door openings on cars not equipped with doors, where such cars are loaded with a commodity requiring that the door openings be protected. As the rule now reads, the lading must be protected by placing strips or slab wood, whether the lading does or does not require it; hence, we felt that some latitude might be given the shipper, and therefore wish to add after the words in the second sentence, "cars without doors," the words, "and containing freight of a character requiring it." This would make the second sentence of rule 124 read as follows:— "Cars without doors, and containing freight of a character requiring it, must

Standard Main and Side Rod Ends.

have the lading protected from falling or rolling out of the car by strips or slab wood, not less than 1½ in. thick at centre, nailed to inside of door posts, and sufficiently close to floor of car and to each other to prevent lading from passing between them."

We have also had a great deal of correspondence recently in reference to the subject of proper method of loading triple loads of long flexible material (angle irons and plates) as specifically referred to in paragraph 15-E on pg. 10. It is a fact, if such lading is built up in accordance with the present prescribed practice, and the load bears on the sliding pieces on the centre car, there is some danger of upsetting the car on account of the lading shifting or sliding toward the outer edge in going round a curve, and by its bearing rather heavily at this particular point would contribute to the greatest liability of derailment. Still, we do not feel that we have as yet obtained sufficient data or information along this line to warrant changing the present practice or adding any additional rules to the code, it being our idea that such shipments for the present should be handled under special instructions until we have an opportunity to further study the subject with a view of ascertaining the best and safest practice for shipment of such material.

Report of Committee on Main and Side Rods

The Master Mechanics Committee, W. F. Kiesel, Jr., Assistant Mechanical Engineer, Pennsylvania Rd., Altoona, Pa., Chairman, reported as follows:—

A year ago a progress report was submitted, and criticisms and suggestions requested. Your committee has received none, and therefore assumes that the members are satisfied with the formulae as they stand.

Checking Formulae

All measurements in inches and pounds.

A = Area of section considered
a = Width of section considered
b = Depth of section considered.
C_1 = Maximum compression unit stress for traverse bending.
C_2 = Maximum compression unit stress for vertical bending.
$C = C_1 - C_2$ = Coefficients.
d = Cylinder diameter.
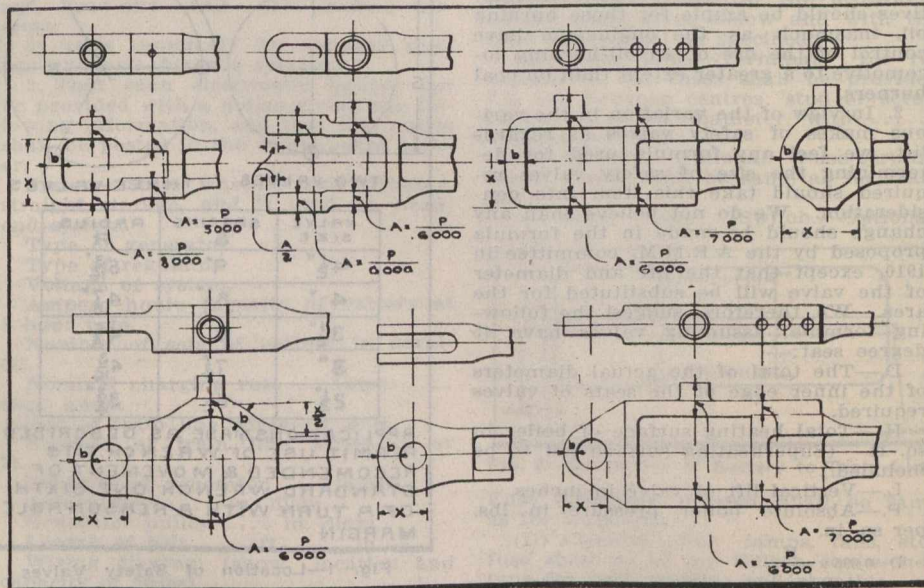L = Length of rod from centre to centre of pins.
M = Bending moment.
P = Maximum compression strain acting at the end of rod
p = Maximum boiler pressure
Q = Cylinder pressure $= 0.7854\, d^2 p$.
R = Radius of driving wheels
r = Radius of crank.

RG = Radius of gyration of section-axis horizontal.
rg = Radius of gyration of section — axis vertical.
S = Stress. Where used in formulae must not exceed one-sixth of ultimate strength of the steel.
s = Horizontal offset in rod.
SM = Section modulus of section considered – axis horizontal.
sm = Section modulus of section considered – axis vertical.
W = Weight on pairs of drivers actuated through rod considered.
Main rod area must not be less than $P \div 10000$ lbs.
For main rods, $P = Q$.
For side rods, $P = \dfrac{0.3\,WR}{r}$

To determine C_1 and C_2, calculation should be based on a section half way between rod pins.

For transverse bending in rods having knuckle pins flexible transversely,

$$C_1 = \frac{\frac{P}{A}}{1 - \frac{PL^2}{675\,000\,000\,A\, rg^2}}$$

For all other rods,

$$C_1 = \frac{\frac{P}{A}}{1 - \frac{PL^2}{1\,200\,000\,000\,A\, rg^2}}$$

For vertical bending in all rods,

$$C_2 = \frac{\frac{P}{A}}{1 - \frac{PL^2}{300\,000\,000\,A\, RG^2}}$$

Values for C_1 and C_2 can also be taken from tables in "Kent's Pocket Book" under heading "Merriman's Rational Formula for Columns".

First—
For rods without offset, the larger value of C_1 and C_2 should be taken equal to S.

For rods with offset, the larger value of $C_1 + \dfrac{Ps}{sm}$ and C_2 should be taken equal to S.

Second—

$$S = C\, \frac{AL^2 r}{SM} + C_1 P \left(\frac{1}{A} + \frac{s}{sm} \right)$$

The calculations should be based on a section located at a distance $0.6L$ from crosshead pin for main rods, and half way between pins for side rods.

Values of C_1 and C_2

	Revs per min =	265	325	375	420
Main Rod	C =	0.036	0.055	0.073	0.091
	C_1 =	0.500	0.500	0.400	0.300
Side Rod	C =	0.071	0.106	0.142	0.177
	C_1 =	0.500	0.500	0.500	0.500

The coefficients selected should correspond with the highest number of revolutions per minute which the locomotive can make.

If this cannot be determined, use 420 R.P.M. for high speed passenger, 375 R.P.M. for pass. and high speed freight, 325 R.P.M. for all other locomotives.

Very simple rules for rods without offset and having bodies with rectangular section, based on the above theory follow.

First—
Stress is less than one-sixth of ultimate strength of the steel if L is less than $46a$ or $23b$, and if A is more than P divided by one-eighth of ultimate strength.

Second—

$$S = C_2 \frac{L^2 r}{b} + C_1 \frac{P}{A}$$

Values of C_1 and C_2

	Revs. per min.	265	325	375	420
Main Rod	C_2 =	0.22	0.33	0.44	0.55
	C_1 =	0.50	0.50	0.40	0.30
Side Rod	C_2 =	0.43	0.64	0.85	1.06
	C_1 =	0.50	0.50	0.50	0.50

The allowable stresses for the various sections of rod ends are given in connection with the accompanying diagrams, except where thickness of section is indicated by the letter "b". The figures denote maximum stress allowed under end load P. If the minimum areas of the two members differ, take double the lesser area for A.

The minimum area at points indicated by the letter "b" should be:—

For main rods—

$$A = \frac{PX}{30\,000\, b}$$

For side rods—

$$A = \frac{PX}{60\,000\, b}$$

In which X is the average diameter of eye, or average spread of jaw members.

Report of Committee on Mechanical Stokers.

The Master Mechanics' Committee, T. Rumney, Assistant to Vice President, Chicago, Rock Island and Pacific Ry., Chicago, chairman, reported as follows:—

Last year your committee expressed the expectation that this year, judging from the progress which was being made in the development of the mechanical stoker, it would be able to report finally on a few stokers which had then been developed sufficiently to render practically uninterrupted service. Your committee also pointed out that the principal benefit to be derived from the utilization of a perfected stoker fulfil-