AMERICAN LOCOMOTIVE COMPANY

NEW YORK CITY

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MANUAL OF THE AMERICAN ARTICULATED COMPOUND LOCOMOTIVE

SECOND EDITION

An articulated compound locomotive is one having two sets of cylinders which drive separate and independent groups of wheels and one of which ordinarily uses exhaust steam from the other. Both sets of cylinders are supplied with steam from a single boiler.

The rear group of wheels is carried in frames rigidly attached to the boiler in the usual manner; while the frames which carry the front group of wheels are not secured to the boiler; but support it by means of sliding bearings.

There is a hinged connection between the frames of the front engine and those of the rear engine which permits the front group of wheels to swivel radially when the locomotive passes through a curve. The front group is thus, in effect, a truck.

Because of this feature from which its name "articulated" is derived, this type of locomotive may have twice as many driving wheels as a locomotive of rigid frame construction with no longer rigid wheel base.

Consequently, the articulated locomotive can be designed to pass through the same curves as any locomotive of the rigid frame type, and at the same time to provide twice the tractive power with no greater axle load or the same tractive power with but one-half the axle load of the latter.

In addition to these advantages, due to its wheel arrangement, the articulated compound locomotive possesses all those derived from compounding the steam. Steam from the boiler is admitted to the first set or high pressure cylinders which ordinarily drive the rear group of wheels; and, having done work in those cylinders, is then used over again in the second set or low pressure cylinders, which are connected to the front group of wheels. From the low pressure cylinders, the steam is exhausted to the atmosphere.

Fig. 1. AMERICAN ARTICULATED COMPOUND LOCOMOTIVE

Connecting the high and low pressure cylinders is a large pipe called the receiver, into which the steam from the high pressure cylinders exhausts when the locomotive is working compound. From the receiver, the steam is admitted into the low pressure cylinders by their valves in the usual manner.

The low pressure cylinders have a larger piston area than the high pressure cylinders, the relative size of the two being such that, at the ordinary working cut-off, the steam at the lower pressure per square inch, acting against the larger piston area, exerts the same force as the higher pressure steam acting on the smaller area. Consequently, the stroke of the high and low pressure cylinders being the same, the two sets of cylinders ordinarily do practically equal amounts of work.

By using the steam successively in two cylinders in a comound locomotive, more of the steam is utilized in effective work than in a simple locomotive in which the steam is only used once; in other words, the same amount or volume of steam does more work.

The use of compounding, superheater, firebrick arch, and large heating surface area, all tend to produce an engine, which, when the great power is considered, is very economical in the consumption of fuel and water.

In every compound locomotive steam must be admitted direct from the boiler to the low pressure cylinders in starting and until they are supplied with steam by the exhaust from the high pressure cylinders. Provision is also usually made by which in cases of emergency, when additional hauling capacity is required, the locomotive may be changed from working compound into simple with an increase in power.

In the American articulated compound locomotive, a special mechanism called the intercepting valve performs these two duties. This valve is located between the receiver and the exhaust

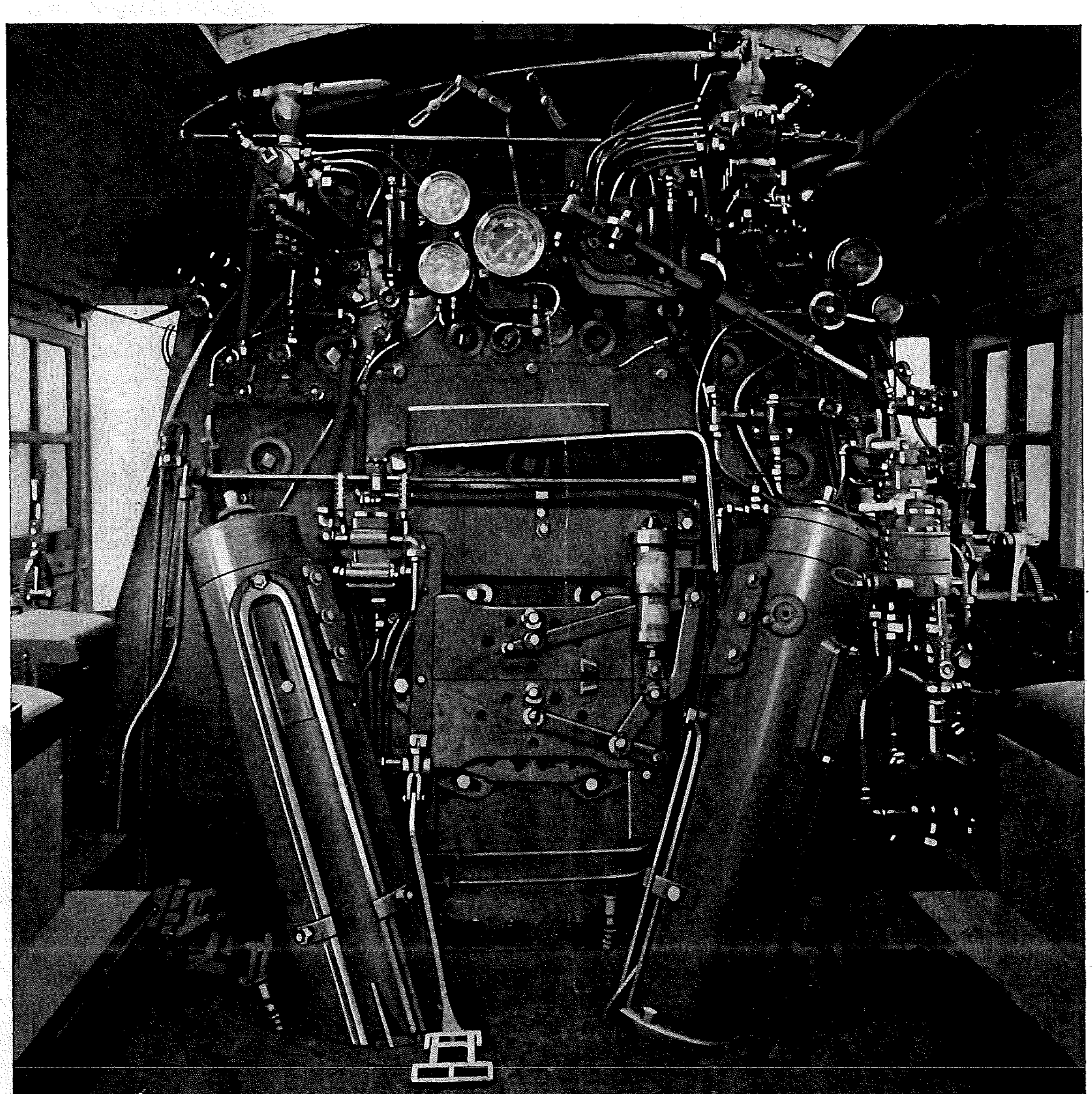

Fig. 2. INTERIOR VIEW OF THE CAB OF THE AMERICAN ARTICULATED COMPOUND LOCOMOTIVE

passages from the high pressure cylinders. It is practically automatic in its operation, and is described in detail in the following pages.

Other locomotive builders use a by-pass arrangement for admitting live steam to the low pressure cylinders in starting or working simple. By this arrangement communication is established between the two ends of the high pressure cylinders by opening a valve operated from the cab. It lacks the advantage possessed by the intercepting valve of preventing increased back pressure on the high pressure pistons when the locomotive is working with live steam in both sets of cylinders.

In the American Locomotive Company's system of compounding, the intercepting valve is so designed that when the engine is working simple the exhaust from the high pressure cylinder passes directly to the atmosphere and the valve cuts off communication between the receiver and the exhaust side of the high pressure pistons. This relieves them of all back pressure except that of the steam exhausting to the atmosphere. In addition, the low pressure pistons exert more power when working compound because the pressure of the live steam admitted to them, though reduced, is higher than the ordinary receiver pressure. This additional power added to that secured in the high-pressure cylinders from the reduction of the back pressure gives 20 per cent. total increase in power when working simple at slow speed.

SUMMARY OF RULES FOR OPERATING.

STARTING.—Always open the cylinder cocks in starting.

CHANGING TO SIMPLE WORKING.—Work the locomotive simple only when it cannot otherwise start the train or when the train is about to stall.

Never work the locomotive simple when it is running at a speed of over 3 or 4 miles an hour, as at such speed no increase in power will be obtained.

DRIFTING.—When drifting, keep the reverse lever at ¾-stroke or more, as the locomotive will then drift freely.

CARE OF SPECIAL PARTS.—The by-pass valves should be taken out and cleaned periodically to prevent them from getting gummed and sticking. When the locomotive is first put into service, these valves should be cleaned quite frequently for a few times to keep them free from the core sand, which is sure to work in.

LUBRICATION.—Give the intercepting valve a liberal feed of oil for a minute before starting, and occasionally during long runs when the throttle is not shut off for a considerable period of time. Except for this, one drop of oil to the intercepting valve every four or five minutes is ample when running.

A list of the other parts of the American articulated compound locomotive which should be oiled and which are not found on the ordinary locomotive is given below, together with instructions as to the frequency with which they should be oiled.

Sliding boiler bearings on the front engine (before starting on a trip).

The ball joint in front of the high pressure cylinder (before starting on a trip).

The upper or rear ball joint of the exhaust pipe (before starting on a trip).

The lower or front ball joint of the exhaust pipe (before starting on a trip).

The bolt of the articulated connection between the two groups of wheels (before starting on a trip).

The ball bearings of the vertical suspension or "trim" bolts which connect the upper rails of the front frames with the lower rails of the rear frames (before starting on a trip).

The ball bearings of the floating columns (if applied) (before starting on a trip).

TESTING FOR BLOWS.—To test for blows in the valves or pistons, throw the emergency valve in the cab to the simple position, namely with the handle pointing to the rear. Spot the locomotive and test the same as a simple locomotive.

IN CASE OF ACCIDENTS.—If one or more of the cylinders may be disconnected and the locomotive run in on the remaining cylinders, simply throw the emergency operating valve into simple position. Disconnect and block the disabled cylinder or cylinders.

INTERCEPTING VALVE.

Among the distinctive features of the American articulated compound locomotive, practically the only ones in which engineers are interested, as relating to the operation of the locomotive, are the intercepting valve and the by-pass valves.

The intercepting valve, the purpose of which has been already stated, is the same in principle as that used on the well-known two-cylinder cross-compound locomotive built by the American Locomotive Company, commonly known as the Richmond Compound. It differs from the latter only in certain modifications of the design, which the use of four cylinders, instead of two, necessitated.

Engineers who have operated the two-cylinder cross-compound of this build will be perfectly familiar with the construction and operation of the intercepting valve as applied to the American articulated compound locomotive. In any case, as the operations of this valve are all automatic except that by which the locomotive is changed from compound into simple working, practically no special knowledge is required to handle the articulated compound.

Changing into simple working is effected by simply opening an operating valve in the cab which controls the emergency exhaust valve. The emergency operating valve is an ordinary angle valve located in a small steam pipe running to the emergency exhaust valve. It is only used if the train is about to stall; that is, in an emergency; or in case of an accident in which one or more of the cylinders can be disconnected and the locomotive run in on the remaining cylinders.

The intercepting valve is located in the saddle of the left high pressure cylinder, to the left of the vertical and above the horizontal center line of the cylinders.

Its various parts are shown in Fig. 3. These parts assembled and in their relation to the steam passages in the cylinders are shown in Figs. 4 and 5, the latter being illustrated on the inset.

Parts 2, 3 and 5 of Fig. 3 constitute the intercepting valve proper.

Part 1 is the reducing valve or sleeve which fits on the stem of the intercepting valve along which it is free to slide longitudinally; as Fig. 4 shows.

The movements of all these parts are automatic.

Part 6 of Fig. 3 is the emergency or high pressure exhaust valve which as previously stated is the only part of the intercepting mechanism

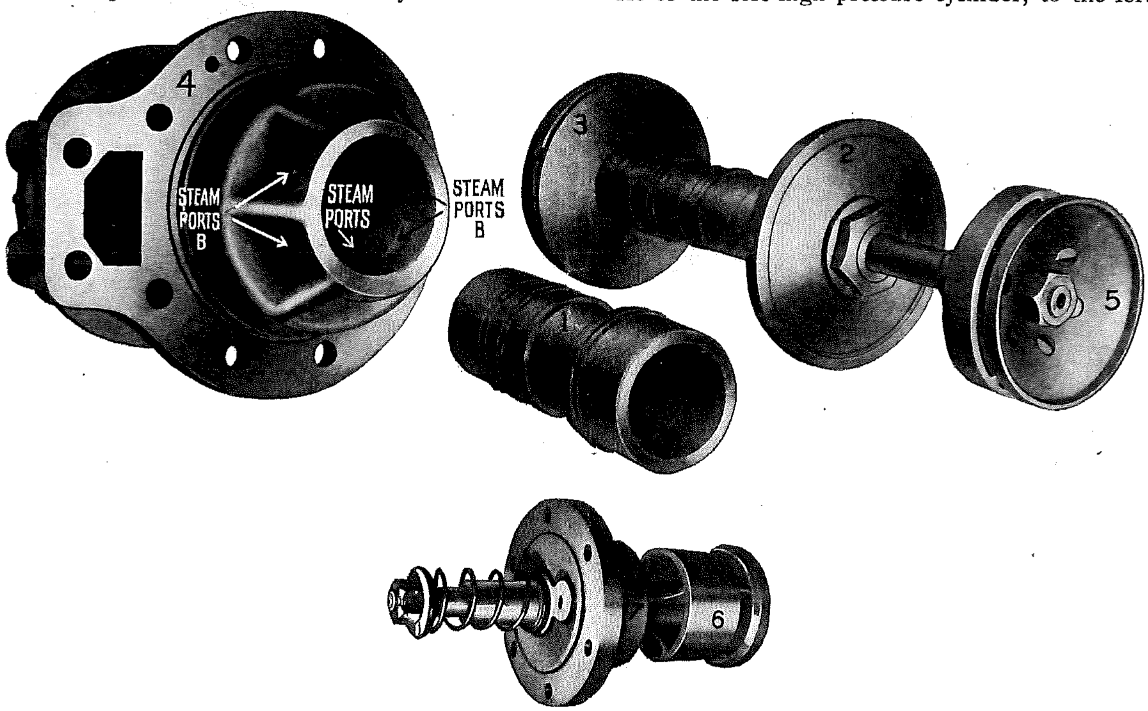

Fig. 3. PARTS OF THE INTERCEPTING VALVE

No. 1. Reducing Valve or Sleeve
No. 2. Intercepting Valve
No. 3. Dash-pot Piston
No. 4. Intercepting Valve Chamber Head
No. 5. Unbalancing Valve
No. 6. Emergency or High Pressure Exhaust Valve
No. 7. Emergency Valve Chamber Head

which is not entirely automatic in its operation; but is under the control of the engineer through an operating valve in the cab. It is located, as will be seen, in Figs. 4 and 5, at one of the outer ends of the intercepting valve chamber.

Fig. 4 is a reproduction of a working drawing of the intercepting valve assembled.

In this illustration, the valve is shown in two positions; No. 1 representing the position the parts automatically assume when the locomotive is working compound, and No. 2 their position when the locomotive is working simple.

Chamber "C" opens directly into the receiver pipe. Communication between chambers "A" and "C" is established through the reducing valve (1).

Chamber "F" connects directly with the exhaust passages of the high pressure cylinders.

Between chambers "F" and "C" is the intercepting valve (2).

Chamber "F" is also connected with chamber "L" through the balancing piston (5) in which are a number of holes.

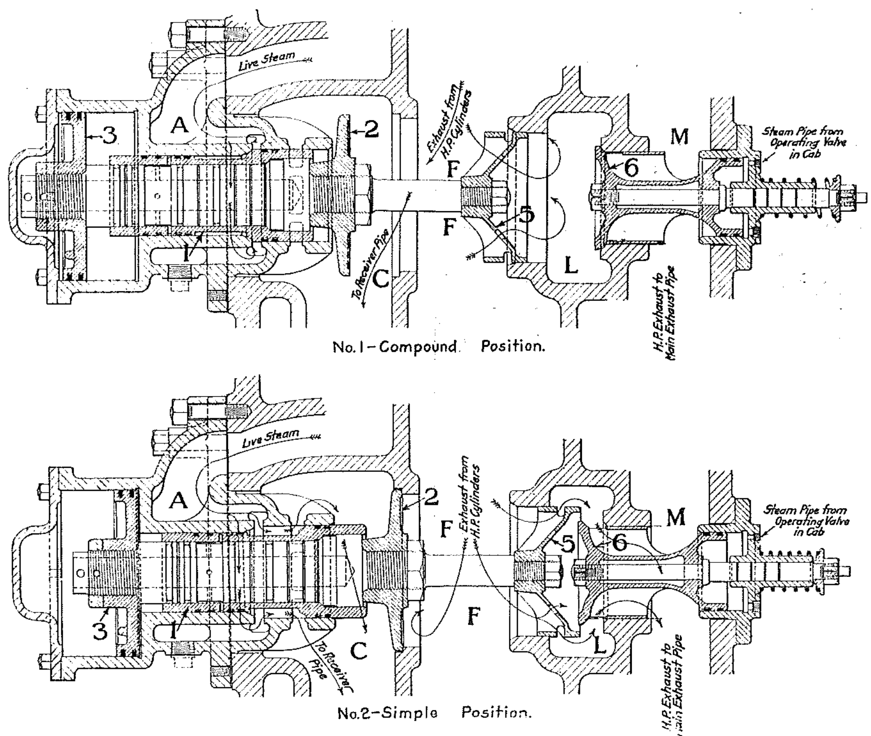

Fig. 4. INTERCEPTING VALVE

The valve in the same two positions is shown respectively in Nos. 3 and 4 of Fig. 5. In this figure, the parts are shown in perspective, and the illustrations are intended to show them as nearly as possible as they would actually appear if the cylinder casting were cut away, as represented.

Corresponding parts are identified by the same numbers or letters in both illustrations. In each, the course of the steam is indicated by arrows. The two may thus be easily studied in conjunction so as to most clearly understand the construction and operation of the American Locomotive Company's system of compounding.

By reference to Figs. 4 and 5 the following is apparent: Chamber "A" which surrounds the reducing valve (1) is in direct communication with the live steam passages of the high pressure cylinders.

The emergency valve (6) establishes communication between chambers "L" and "M" the latter of which opens directly into the high pressure exhaust pipe, the small pipe which runs along the left side of the locomotive and connects to the main exhaust pipe.

Thus it will be seen that the reducing valve (1) controls the admission of the live steam from the boiler to the receiver pipe; the intercepting valve (2) opens or closes the receiver pipe to the exhaust from the high pressure cylinders; and the emergency valve (6) permits or prevents this exhaust from escaping through the main exhaust to the atmosphere.

When the locomotive is started in the ordinary way, the pressure in chamber "A" opens the reducing valve (1), and this movement in turn closes the intercepting valve (2).

View No. 1 of Fig. 5 shows the valve in this position. Live steam is admitted to the receiver, and at the same time is prevented by the intercepting valve from backing up against the exhaust side of the high pressure pistons. These consequently start free from back pressure.

The reducing valve is so designed as to reduce the live steam entering the receiver to such a pressure that the low pressure cylinders will do the same amount of work as the high pressure cylinders.

Usually, this means a reduction to about 40 per cent. of boiler pressure. In the case of 200 pounds working pressure the live steam in the receiver would be reduced to 80 pounds.

If the pressure in the receiver rises above the amount to which the reducing valve (1) is designed to reduce it, the valve automatically closes and cuts off the admission of live steam to the receiver. It then remains closed until the movement of the low pressure pistons lowers the pressure in the receiver to the required amount when it again opens. View No. 2 in Fig. 5 shows the position of the parts of the intercepting valve under the above conditions. The reducing valve can close without opening the intercepting valve (2); but these two valves cannot both be opened at the same time.

After one or two revolutions of the driving wheels, the steam exhausting from the high pressure cylinders into chamber "F" accumulates and its pressure rises sufficiently to open the intercepting valve (2) which in turn closes the reducing valve (1). The locomotive thus works compound; that is, the low pressure cylinders are supplied with steam by the exhaust from the high pressure cylinders. Views No. 1 of Fig. 4 and No. 3 of Fig. 5 illustrate the intercepting mechanism in compound position.

The intercepting valve is usually so designed that when the pressure in chamber "F" has reached 30 per cent. of boiler pressure, it will open the valve against the steam in chamber "C" of 40 per cent. of boiler pressure, because the latter acts against a smaller area.

From the foregoing, it will be seen that, when operated in the usual way, the American articulated compound locomotive starts with live steam in all four cylinders and after a few revolutions of the driving wheels changes of itself into compound working.

If it is desired to prevent the locomotive from changing into compound after it is started, or to work it simple, and thus secure the maximum power of the locomotive at a critical point, it is only necessary for the engineer to open the emergency operating valve (N. Fig. 2) in the cab by turning it so that the handle points to the *rear*.

This opens the emergency valve (6) and allows the exhaust from the high pressure cylinders to escape to the stack. The reducing valve (1) is immediately opened, there being no resisting pressure in chamber "F," and closes the intercepting valve (2). Live steam is admitted to the receiver which at the same time is cut off from the exhaust side of the high pressure pistons and increased back pressure thus prevented.

The balancing piston (5) is employed in order that chamber "F" may be exhausted instantaneously with the opening of the emergency valve; with the result that the intercepting valve is closed and the reducing valve opened before or at the same moment that the receiver is actually exhausted. This prevents any drop of pressure in the low pressure steam chest during the change from compound to simple.

View No. 2 of Fig. 4, and view 4 of Fig. 5 show the positions of the parts of the intercepting mechanism when the engine is working simple.

A brief summary of the conditions existing when the intercepting valve is in the simple position will explain the 20 per cent. increase in the normal maximum tractive power which, as already stated, is attained by working the locomotive simple. The high pressure pistons are relieved of the back pressure in the receiver amounting to about 30 per cent. of the boiler pressure which acts against them when the locomotive is working compound. On the other hand, the low pressure cylinders receive live steam of 40 per cent. of the boiler pressure instead of exhaust steam from the high pressure cylinders at a pressure of only 30 per cent. of boiler pressure, as ordinarily. The increase would be greater were it not for the wire-drawing of the steam through the restricted area of the ports of the reducing valve which are intentionally reduced for operation under this condition.

It is important to know and bear in mind that the reducing valve is so designed that at speeds of more than three or four miles an hour no increase in power is obtained by changing the locomotive into simple. This is done in order that the emergency feature may not be misused, with increased wear on the machinery and sacrifice of economy in fuel consumption.

The engineer must also remember that the locomotive having been changed into simple working by opening the emergency operating valve will continue to work simple until this valve is closed. The operating valve is closed when the handle points *forward*.

In changing from compound to simple when running, the sudden unbalancing of the intercepting valve tends to close it rapidly with the result that it would slam were not some provision made to prevent this. For this purpose, the piston (3) working in an air dash-pot at the outer end of the intercepting valve stem is employed.

Years of successful operation of this system of compounding, which has been previously applied to a large number of cross-compound locomotives, has proven that it is simple and reliable. Only a few simple rules are necessary for the guidance of the engineer in the proper care and operation of the locomotive.

Ordinarily, in starting, it is only necessary to open the throttle with the reverse lever in the position required for the weight of the train which is usually in the extreme notch, and with the cylinder cocks open.

If the train is about to stall, the locomotive should be changed into simple working by opening the emergency operating valve.

The intercepting valve should be given a liberal feed of oil for a minute before starting and occasionally during long runs when the throttle is not shut off for a considerable length of time. Outside of this, one drop of oil every 4 or 5 minutes is ordinarily ample when running.

This simple care will prevent any tendency for the parts of the intercepting mechanism to stick; but if neglected, the reducing valve might stick in a closed position which would prevent the admission of steam to the low pressure cylinders when the throttle is opened.

In the event that through neglect the reducing valve does stick, the difficulty can ordinarily be remedied by giving it a little extra feed of oil. If that fails, the cover of the dash-pot may be removed and the reducing valve moved in and out a few times with a bent piece of ¼-inch wire, after which it will probably clear itself when the throttle is opened.

DOUBLE PORTED PISTON VALVES.

The double ported slide valve has been most generally used on the low pressure cylinder of the American articulated compound engine. This valve, because of the low receiver pressure under which it works, has proven very satisfactory, but on the larger engines it has required very close attention as to lubrication and to keep the balancing feature in proper condition in order to minimize the wear of the sliding faces.

Single ported piston valves have often been suggested, but it has been found impossible to secure the proper in and outlet area for the low pressure cylinder without excessive diameter and weight.

A double ported piston valve has been found to meet the required conditions and is becoming more and more in favor by the different users of this type of engine. For practical reasons this valve is made the same diameter as the high pressure single ported valve, so that packing rings, followers, and casing heads are interchangeable for both high pressure and low pressure valves.

BY-PASS VALVES.

These play an important part in the successful operation of the American articulated compound locomotive and although automatic in their operation they should be understood by the engineer.

They are applied to the low pressure cylinders and establish communication between the two ends of the cylinder when the locomotive is running with the throttle closed. This permits free circulation of air from one end of the cylinder to the other; and thus prevents any injurious effects from alternating vacuum and compression, which would otherwise occur from the pumping action of the large pistons when the locomotive is drifting.

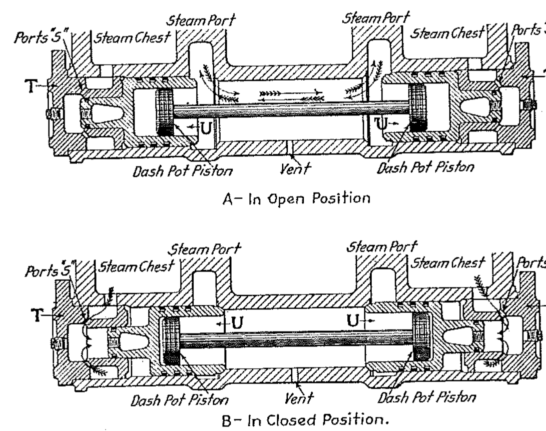

Fig. 7. BY-PASS VALVES

Fig. 7 illustrates the arrangement of the by-pass valves when assembled in their chamber and their relation to the steam ports in the cylinders. Each cylinder is provided with a pair of these valves which are located in chambers cast in the outside of the cylinders.

When the throttle is open, the pressure in the steam chest acting through the small ports "S" keeps the valves closed as shown in view "B" of the above figure. When the throttle is closed, they are automatically opened by the atmospheric pressure admitted through the air vent and connect the admission ports at either end of the cylinder as shown in view "A."

With the by-pass valves, the locomotive drifts more freely when running with a long cut-off. It is strongly recommended, therefore, that in drifting the reverse lever be kept at ¾-stroke, or more.

The by-pass valves require only ordinary attention, but as their duties are important they should not be entirely neglected. The principal care required is that they be kept clean.

When the locomotive is first put into service, the by-pass valves should be taken out and cleaned quite frequently to keep them free from core sand which will undoubtedly work in.

The engineer can tell at once if the by-pass valves do not close when the throttle is open. This would not only cause a severe blow, but steam would also escape from the small pipe projecting from under the cylinder jacket midway between the ends of the cylinder. This pipe connects to the air vent in the center of the chamber containing the valves.

If the low pressure engines thump and the locomotive does not drift freely, the trouble is probably due to the fact that the by-pass valves are stuck in the closed position by being gummed. In such event, they should be taken out and cleaned at the first opportunity.

If the locomotive is allowed to drift with the reverse lever hooked up, smoke-box gases may be sucked in by the cylinders and gum the by-pass valves. This possibility will be minimized if the reverse lever is kept in the position as recommended above when drifting.

Periodical cleaning of these valves is recommended.

VACUUM AND RELIEF VALVES.

Vacuum valves are located in the high pressure steam chests or some other convenient place which is in communication with the steam chests. The function of these valves is to admit free air into the steam chests when the locomotive is drifting so as to avoid a vacuum and give a moderate flow of air through the cylinders.

The low pressure cylinders are equipped with combined vacuum and relief valves, which, in addition to having functions similar to the vacuum valves of the high pressure cylinders, also regulate the steam pressure in the low pressure steam chests. These relief valves are set at 45 per cent. of the boiler pressure and should be tested occasionally to see that they are properly set.

If they rise from their seats frequently when the locomotive is working compound, it may be due to a blow in either the valves or pistons of the high pressure cylinders; as such a blow would increase the pressure in the receiver, causing the relief valve to open. In such a case, the high pressure valves and pistons should be tested.

To test for blows, simply open the emergency operating valve in the cab; or in other words, change the locomotive into simple working. Spot the locomotive and proceed the same as with a simple engine.

IN CASE OF ACCIDENTS.

In case of any accident in which one or more of the cylinders may be disconnected and the locomotive run in with the remaining cylinders active; simply throw the emergency operating valve (N. Fig. 2) in the cab into the simple position and proceed as with a simple locomotive. Disconnect and block the disabled cylinder or cylinders. This is the only rule to follow and the only one to be remembered, and covers all cases of accidents which do not entirely disable the locomotive.

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D.&R.G.R.R.

61-L-94-A

STANDARD PRACTICE

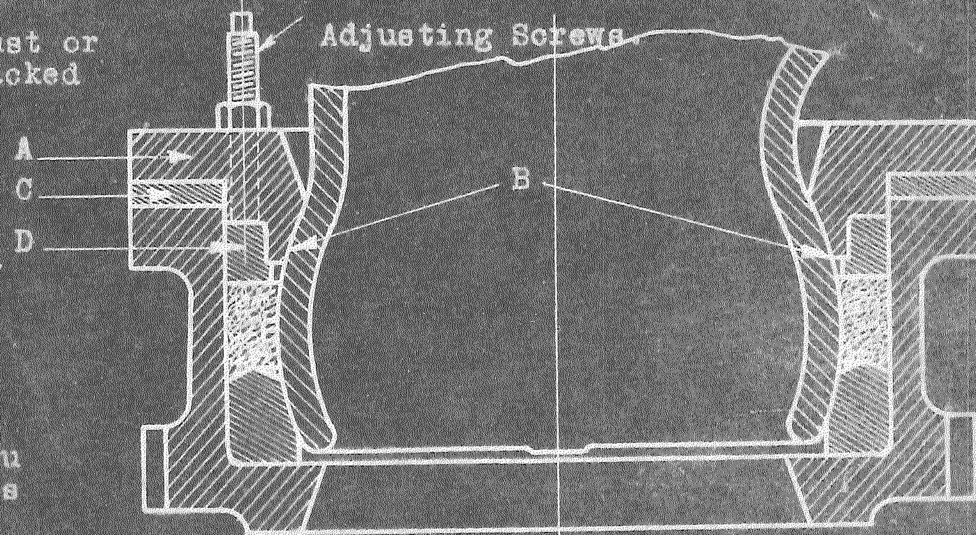
M. J. O'Neill
GEN. MECH. SUPT.

~~10-8-31~~ 6/18/29

PACKING – BALL JOINTS ON MALLET EXHAUST PIPES

Ball Joints on Mallet exhaust or Receiver Pipes should be packed as follows:-

Gland "A" should be tightened up until it bears evenly on the joint "B". Studs should then be slacked off until a 1/32" liner can be inserted at "C" and again tightened. Then soft packing follower "D" should be set up by means of the adjusting screws thru the gland until the joint is tight.



Instead of inserting liner at "C", the spacing ring may be renewed and made 1/32" thicker than the gap shown when the gland "A" is tight against the joint "B".

CHRIS AHRENS

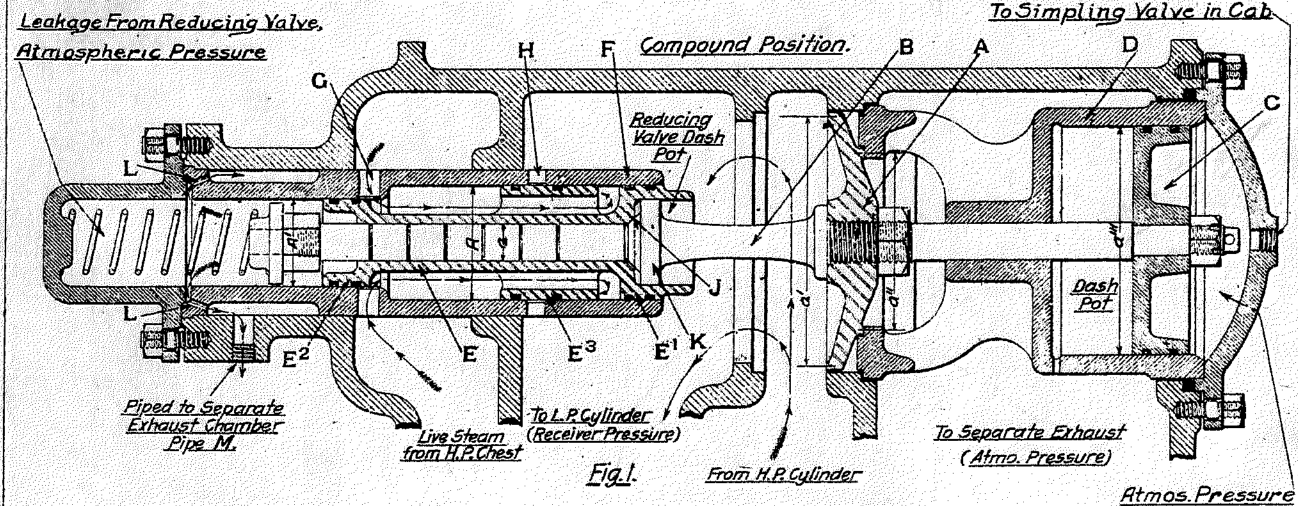


Fig. 1.

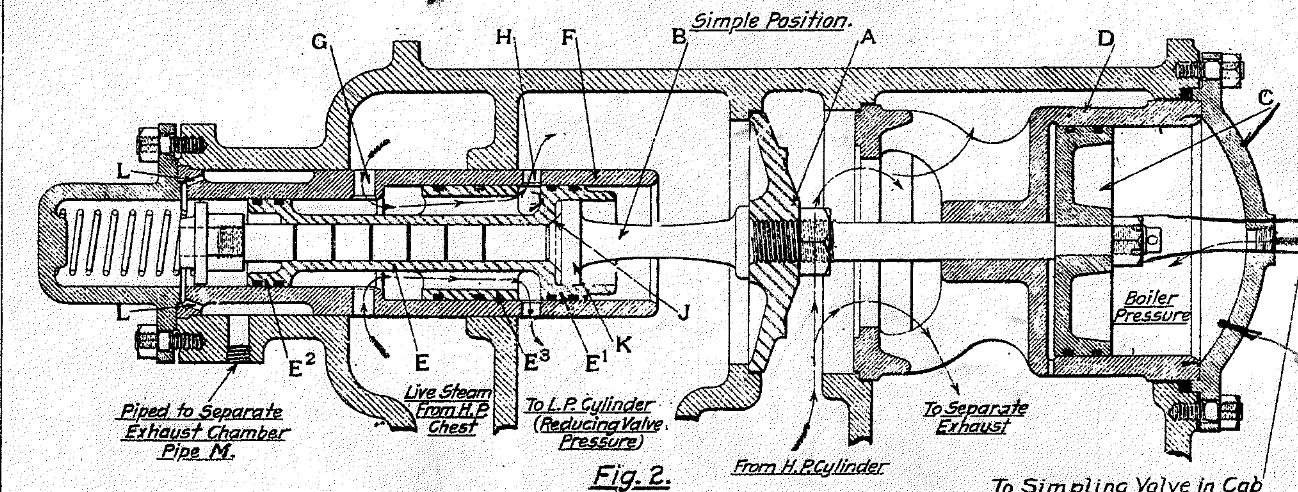


Fig. 2.

Simplex Intercepting Valve Calculations

A – Area of large end of Reducing Valve
A' = " " small " " "
a = " " Stem of Intercepting Valve
a' = " " Intercepting Valve (Centre of Joint)
a'' = " " Separate Exhaust Valve (Centre of Joint)
a''' = " " Operating Piston

P – Boiler Pressure
P' – Receiver Pressure working Simple.
p – " " " Compound.
p' – Separate Exhaust Pipe Pressure working Simple.
p'' – Pressure available for operating Piston.
F – Force causing Valve to move into Compound.
f – " " " " " " Simple.

Formula I. Reducing Valve Pressure – P'

$$\frac{\{P(A-A')\}+\{p'(A'-a)\}}{A-a} = P' \text{ When hard at work.}$$

Formula Ia. Reducing Valve Pressure – P'

$$P\frac{(A-A')}{A-a} \quad P' \text{ Standing}$$

Formula II. Force Causing Main Valve to move into Compound – F

$$P(A-A') = F$$

NOTE — This ignores the starting force which is very great. "F" being the force completing the movement under worst conditions.

Formula III Force causing Main Valve to move into Simple – f

$$\{p''a''' + p(A-a)\} - \{pa'' + P(A-A')\} = f$$

Substituting for 200 lbs Boiler Pressure

A for $4\frac{7}{8}$ dia = 18·66	P = 200
A' " $3\frac{5}{8}$ " = 10·32	P' = 109 (From Formula I)
a " $1\frac{1}{2}$ " = 1·77	p = 70 (Max)
a' " $10\frac{1}{4}$ " = 82·52	p' = 20 Assumed
a'' " $7\frac{1}{4}$ " = 41·28	p'' = 160 = P–20% P
a''' " $9\frac{1}{2}$ " = 70·88	
F = 1,668 lbs From Formula II	f = 7,965 lbs From Formula III.

Formula I. $\frac{\{200\times(18{\cdot}66-10{\cdot}32)\}+\{20\times(10{\cdot}32-1{\cdot}77)\}}{18{\cdot}66-1{\cdot}77} = 109$ lbs

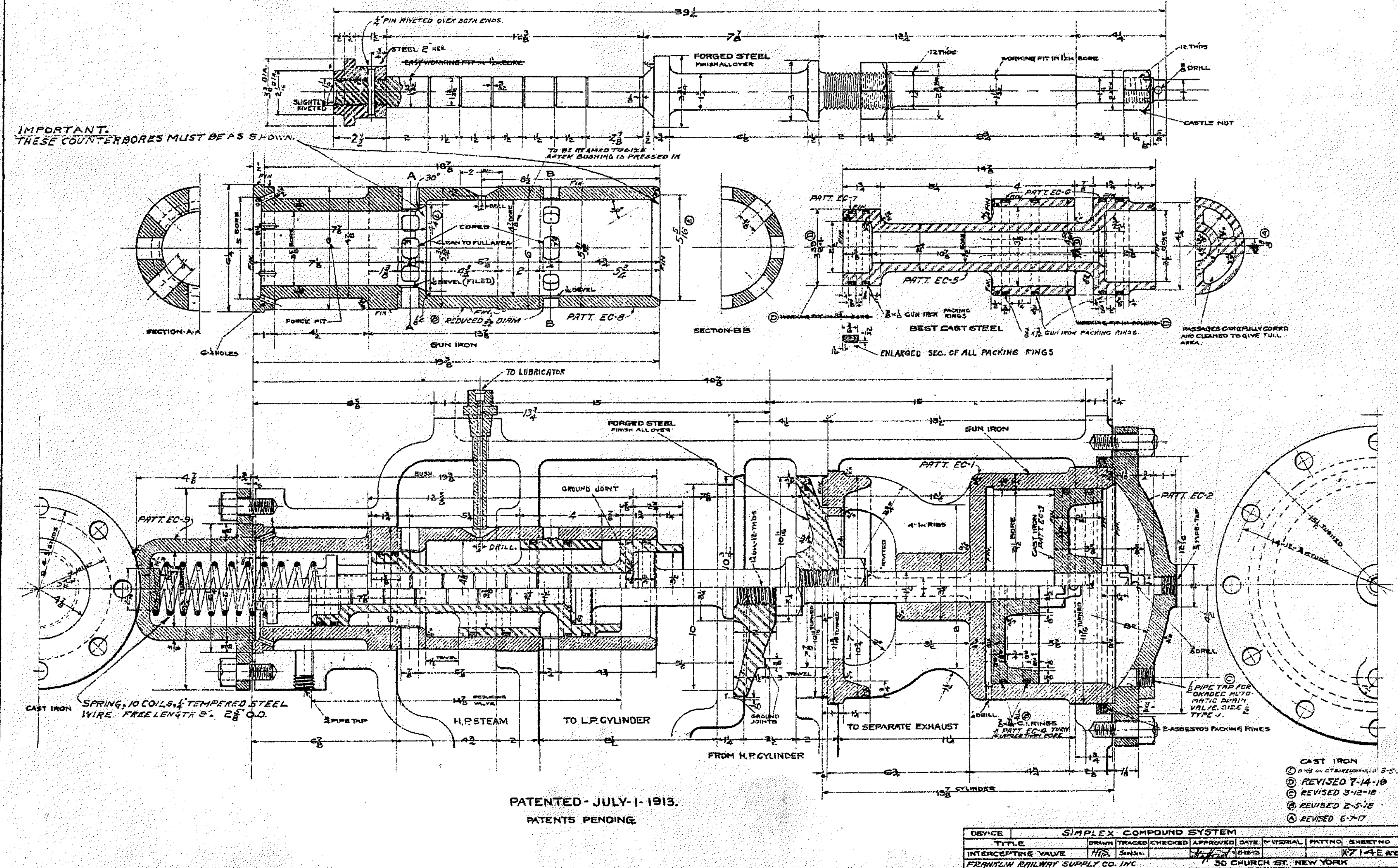
Formula Ia. $\frac{200\times(18{\cdot}66-10{\cdot}32)}{18{\cdot}66-1{\cdot}77} = 99$ lbs

Formula. II. $200\times(18{\cdot}66-10{\cdot}32) = 1{,}668$ lbs

Formula. III. $\{(160\times70{\cdot}88)+70\times(18{\cdot}66-1{\cdot}77)\}-\{(70\times41{\cdot}28)+200\times(18{\cdot}66-10{\cdot}32)\}=7{,}965$

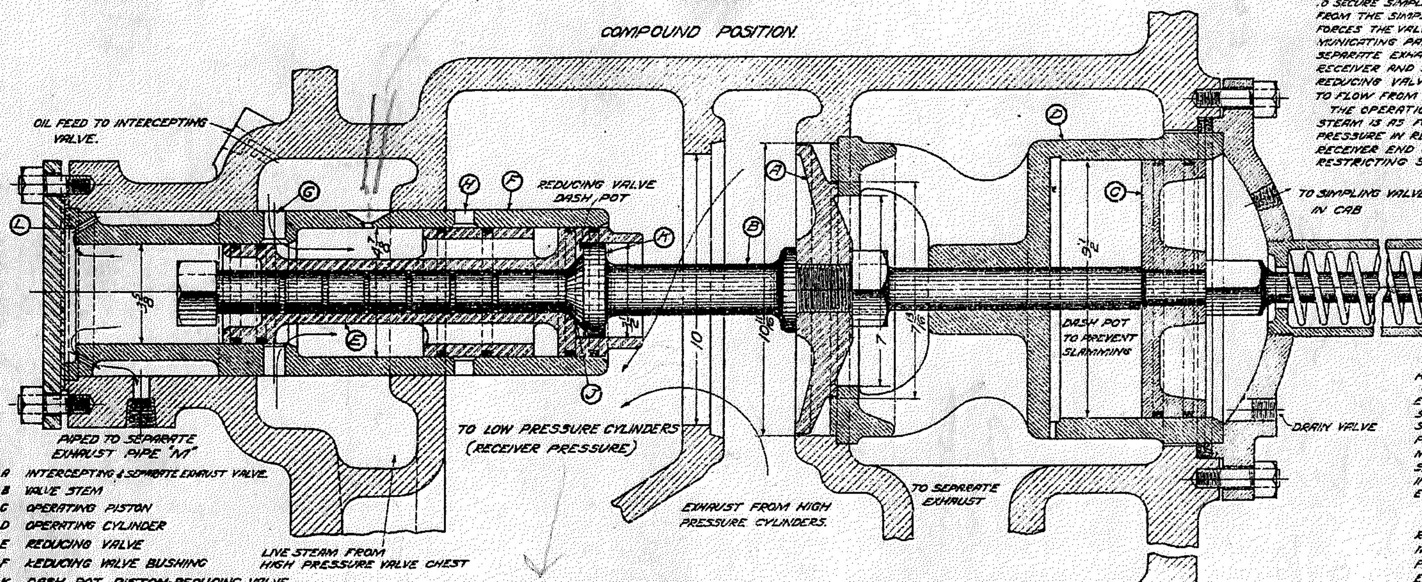
Note — Force of spring ignored, since this is merely sufficient to insure Valve remaining in compound position when throttle is closed.
It's force is added to "F" and subtracted from "f".
On the other functions of the valve it has no effect.

Device					
SIMPLEX COMPOUND SYSTEM					
Title: INTERCEPTING VALVE CALCULATIONS					
Drawn	Traced	Checked	Approved	Date	Sheet No.
H.A.S.	L.S.B.			DEC. 1. 1918	MS-2000
FRANKLIN RAILWAY SUPPLY CO., INC.					NEW YORK N.Y.

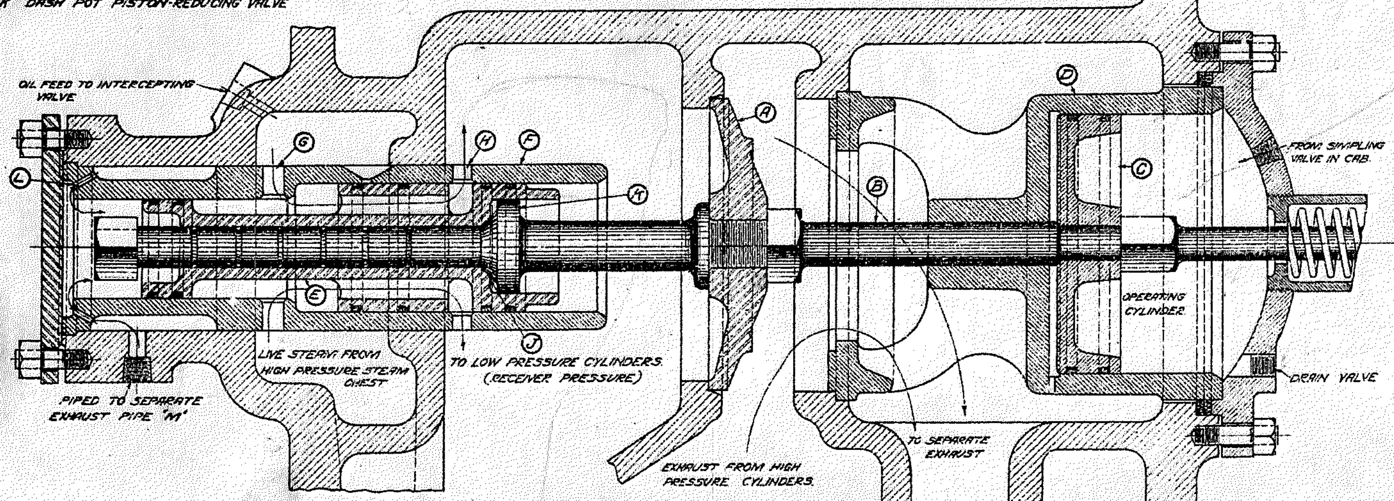


PATENTED - JULY - 1 - 1913.
PATENTS PENDING.

COMPOUND POSITION.



- A INTERCEPTING & SEPARATE EXHAUST VALVE.
- B VALVE STEM
- C OPERATING PISTON
- D OPERATING CYLINDER
- E REDUCING VALVE
- F REDUCING VALVE BUSHING
- K DASH POT PISTON-REDUCING VALVE



SIMPLE POSITION.

OPERATION

THE ARRANGEMENT OF THIS VALVE GIVES A NORMALLY COMPOUND ENGINE. TO SECURE SIMPLE OPERATION OF ENGINE, IT IS NECESSARY TO ADMIT STEAM FROM THE SIMPLING VALVE IN THE CAB TO OPERATING CYLINDER "D" WHICH FORCES THE VALVES ATTACHED TO STEM "B" TO THE LEFT OPENING COMMUNICATING PASSAGE BETWEEN HIGH PRESSURE EXHAUST AND THE SEPARATE EXHAUST CHAMBER AND CLOSING PASSAGE BETWEEN THE RECEIVER AND SEPARATE EXHAUST CHAMBER. AT THE SAME TIME REDUCING VALVE IS MOVED, SO AS TO OPEN PORT "H" ALLOWING STEAM TO FLOW FROM THE REDUCING VALVE CHAMBER TO THE RECEIVER.

THE OPERATION OF THE REDUCING VALVE IN REGULATING THE FLOW OF STEAM IS AS FOLLOWS – STEAM FLOWS THRU PORTS "H" UNTIL PREDETERMINED PRESSURE IN RECEIVER PIPE IS EXCEEDED, WHEN IT REACTS AGAINST THE RECEIVER END OF THE REDUCING VALVE, FORCING IT TO THE LEFT AND RESTRICTING STEAM FLOW THRU PORT "H". SHOULD THE LOW PRESSURE ENGINE SLIP IT WOULD REDUCE PRESSURE IN THE RECEIVER ALLOWING THE REDUCING VALVE TO MOVE TO THE RIGHT AND BUILD UP THE RECEIVER PRESSURE QUICKLY. SHOULD THE HIGH PRESSURE ENGINE SLIP, PRESSURE IN THE SEPARATE EXHAUST PIPE WILL RISE AND PASSING THRU PIPE "M" LEADING TO THE SMALL END OF THE REDUCING VALVE, REACT UPON IT, FORCING VALVE TO THE RIGHT INCREASING THE FLOW OF STEAM TO THE RECEIVER ENABLING THE LOW PRESSURE ENGINE TO TEMPORARILY PICK UP THE WORK LOST BY THE HIGH PRESSURE ENGINE SLIPPING.

COMPOUND POSITION OF THE VALVES IS SECURED BY EXHAUSTING STEAM FROM OPERATING CYLINDER "D" THRU SIMPLING VALVE IN CAB, AFTER WHICH THE ACTION OF STEAM ON THE DIFFERENCE OF AREAS OF THE END PISTONS OF THE REDUCING VALVE CAUSES THE ENTIRE MECHANISM TO MOVE TO THE RIGHT CLOSING THE SEPARATE EXHAUST PASSAGE AND PORTS "H" AND OPENING COMMUNICATION BETWEEN THE HIGH PRESSURE EXHAUST PASSAGES AND THE RECEIVER.

MAINTENANCE

SHOULD STICKING OR SLUGGISH ACTION OF THE VALVES BE REPORTED, LOOK FOR DEPOSIT OF CINDERS OR OTHER FOREIGN MATTER IN THE REDUCING VALVE BUSHING AND SEE THAT PIPE BETWEEN REDUCING VALVE CHAMBER AND SEPARATE EXHAUST PIPE IS CLEAR. DIRTY CONDITION OF THESE PARTS IS DUE TO DRIFTING THE ENGINE WITH THE VALVE IN COMPOUND POSITION.

OPERATING INSTRUCTIONS FOR ENGINEMEN

START TRAIN WITH VALVE IN SIMPLE POSITION.
CHANGE TO COMPOUND WHEN UNDER WAY.
AFTER STARTING, SIMPLE ONLY TO PREVENT STALLING AND JUST BEFORE SHUTTING OFF.
VERY IMPORTANT: BEFORE SHUTTING OFF, PLACE VALVE IN SIMPLE POSITION. IF ENGINE DRIFTS COMPOUND, CINDERS AND SMOKE BOX GASSES WILL BE DRAWN INTO THE INTERCEPTING VALVE AND LOW PRESSURE CYLINDERS, CAUSING DAMAGE.
IF NECESSARY TO DISCONNECT EITHER OR BOTH SIDES OF EITHER ENGINE; TRAIN MAY BE BROUGHT IN BY SIMPLING.
LUBRICATOR FEED MARKED INTERCEPTING VALVE, SHOULD FEED NOT FASTER THAN ONE DROP IN TWO MINUTES.
OIL OPERATING PISTON BEFORE STARTING TRIP, THRU SIMPLING VALVE OIL CUP IN CAB.

THE APPLIANCE SHOWN BY THIS PRINT IS PROTECTED BY PATENTS OWNED OR CONTROLLED BY THE FRANKLIN RAILWAY SUPPLY CO. NEW YORK, N. Y.

SUPERSEDES				SUPERSEDED BY	
DEVICE: SIMPLEX COMPOUND SYSTEM.				TITLE: INSTRUCTION SHEET.	
PATT. NO.		MATERIAL	REMARKS		
DRAWN: MF	TRACED: MF	CHECKED: LNH.	APPROVED	DATE: 1-7-20	SHEET NO: D-18352
FRANKLIN RAILWAY SUPPLY CO., INC.					NEW YORK, N. Y.

Support 1309 - www.wmsrf.o

TRACTIVE POWER-SIMPLE-98300 LBS.— COMPOUND-77 900 LBS.—NUMBER OF ENGINES – 10

SEE ALSO PAGES 80 TO 80-E

C.&O. RY. CLASS H-6

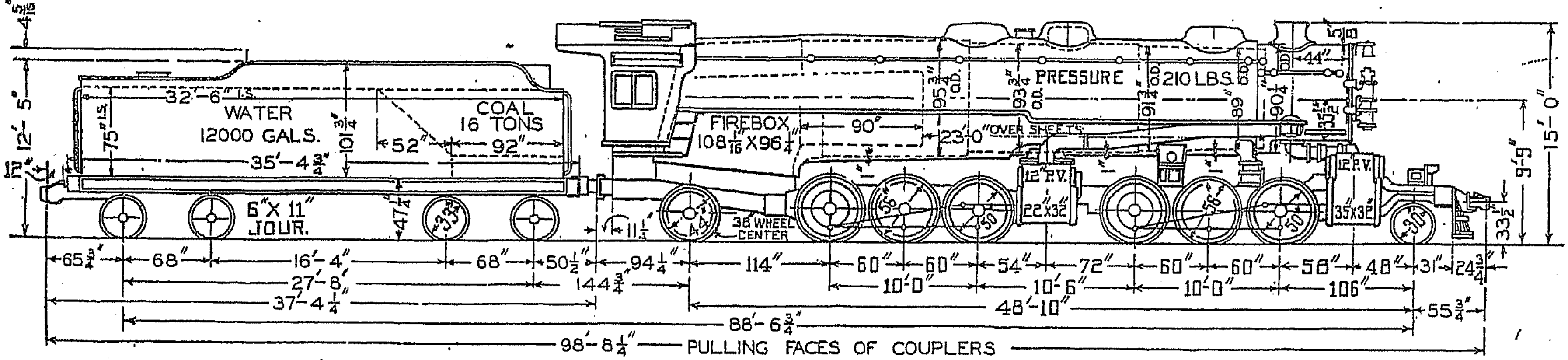
MALLET TYPE

MAXIMUM CURVE – 20°

(80-F)

ENG. NOS. 1300-1309

TENDER CLASS – 12 RC



WEIGHTS	104500	103700	45000	62300	62600	61600	60400	60500	59300	23200

WEIGHTS IN WORKING ORDER
- ON DRIVERS — 366700 LBS.
- ON ENGINE TRUCK — 23200 LBS.
- ON TRAILING TRUCK — 45000 LBS.
- ENGINE TOTAL — 434900 LBS.
- TENDER — 208200 LBS.
- ENGINE & TENDER — 643100 LBS.
- TUBES, NO. 241 — 2 1/4 O.D.
- FLUES, NO. 36 — 5 1/2 O.D.
- TUBES & FLUES, LENGTH — 23'-0"
- ARCH TUBES, NO. 4 — 3" O.D.
- SUPERHEATER TUBES — 1 1/2 O.D.

- FIREBOX LENGTH — 108 1/16
- FIREBOX WIDTH — 96 1/4

HEATING SURFACES
- TUBES & FLUES — 4436 SQ.FT.
- FIREBOX — 363 SQ.FT.
- ARCH TUBES — 26 SQ.FT.
- TOTAL HEATING SURFACE — 4825 SQ.FT.
- SUPERHEATER H.S. — 975 SQ.FT.
- GRATE AREA — 72.2 SQ.FT.
- BOILER HORSEPOWER — 2964
- CYLINDER HORSEPOWER — 2618

- JOURNALS, DRIVING, MAIN — 9 5/8 X 13"
- JOURNALS, DRIVING, OTHERS — 9 1/2 X 13"
- JOURNALS, ENGINE, TRUCK — 5 1/2 X 10"
- JOURNALS, TRAILER, TRUCK — 7 1/2 X 14"

VALVE DATA
- H.P. TRAVEL — 6 1/2 — LAP — 1"
- H.P. LEAD — 1/8 — EXH.CL. — 1/4
- L.P. TRAVEL — 6" — LAP — 1 1/8
- L.P. LEAD — 3/16 — EXH.CL. — 3/8
- VALVE GEAR — WALSCHAERT

- PERCENT BOILER TO CYL. H.P. — 113.2
- FACT. OF ADH. COMP. FRONT-4.63 BACK-4.70
- TENDER FRAME — CAST STEEL
- TENDER TRUCK FRAME — CAST STEEL
- TENDER TRUCK BOLSTER — CAST STEEL
- SUPERHEATER — TYPE-A
- STOKER — STANDARD — TYPE-HT
- REVERSE GEAR — ALCO — TYPE-GR
- SAFETY VALVES — 3 — 3 1/2

SEPTEMBER – 1949

- BUILDER'S ORDER NO. — 48001
- BUILDER — BALDWIN LOCO. WORKS
- YEAR BUILT — 1949