

Summer 1938

New Method of Dispensing Tear Gas in Dealing With Riots and Mobs

Maynard H. Finley

Follow this and additional works at: <https://scholarlycommons.law.northwestern.edu/jclc>

 Part of the [Criminal Law Commons](#), [Criminology Commons](#), and the [Criminology and Criminal Justice Commons](#)

Recommended Citation

Maynard H. Finley, *New Method of Dispensing Tear Gas in Dealing With Riots and Mobs*, 29 *Am. Inst. Crim. L. & Criminology* 254 (1938-1939)

This Criminology is brought to you for free and open access by Northwestern University School of Law Scholarly Commons. It has been accepted for inclusion in Journal of Criminal Law and Criminology by an authorized editor of Northwestern University School of Law Scholarly Commons.

A NEW METHOD OF DISPENSING TEAR GAS IN DEALING WITH RIOTS AND MOBS

MAYNARD H. FINLEY†

In dealing with mobs and riots, the police department must always keep uppermost in mind the fact that physical violence to participants does not meet with acceptance on the part of the general public. To avoid the creation of resentment, therefore, a means which has the least possible physical after effect must be used in quelling the riot or dispersing the mob.

The use of tear gas has been recognized for some time as a superior method of mob control, having no deleterious after effects. The present procedures used in dispensing tear gas are restricted to guns and grenades. These procedures have definite limitations: (1) Area effectively covered by a single officer is relatively small; (2) Area is not covered uniformly; (3) The time required to cover a large area is great; (4) The number of officers required to cover an extensive area is large.

The needs, then, of any adequate dispensing system are these: (1) The system must be capable of covering a large area; (2) It must cover this area in a minimum amount of time; (3) It must cover the area completely, leaving no spaces where there is no gas present; (4) The gas must be of sufficient density over the area covered to produce the desired results; (5) It should require a minimum number of men to effectively cover the area.

In addition to the foregoing it is also advisable to provide a means for breaking up certain mobs, as in the case of minor disturbances, without the use of tear gas. For this purpose a smoke screen may be used, provided the smoke screen is (1) dense enough to obscure vision, and (2) that it is light enough to rise to a height of 8 or 10 feet, and at the same time heavy enough so that it would not float away rapidly.

Covering a large area with gas in a minimum of time requires greater speed than is possible on foot. While an automobile would speed up the dispensing process, its operation would be limited to street use. If the gas is distributed through the exhaust or by air pressure, or if the automobile passes through an area which has

† Laboratory Technician, Wichita Police Department, Wichita, Kansas.

already been gassed, the car has a serious disadvantage due to the creation of air currents which bring the gas into the vehicle itself. The air stream under the motor and dust pans of the car tends to stay at the same level, and due to the difference in height between the bottom of the motor and pans and the floor boards, a partial vacuum is created next to the floor boards which causes a swirling motion of air and tear gas up toward the floor, resulting in some gas leaking into the car. A partial vacuum is created at the back of the car, due to the air stream over the top and sides setting up a swirling motion at the back which has the same effect as the one under the car, and, in addition, tends to make the gas rise more rapidly, which spoils the effectiveness of the barrage by lifting the gas off the ground.

These difficulties are overcome by the use of a motorcycle. The "three-wheeler" is particularly well suited because (1) it can be used at slow as well as high speeds; (2) it is more stable than a "solo" machine, especially where members of the mob may attempt to grab the handle bars or capsize the machine; (3) it is small and easily handled and can be used over terrain not passable for an automobile; and (4) it does not create the swirling motion of gas since there is less vacuum created.

The distribution of gas and smoke from the motorcycle is accomplished by mounting two cylinders above the gas tank, one for liquid tear gas, the other for the smoke liquid. Each of these cylinders is connected to the exhaust pipe by copper tubing, the connection for the tear gas cylinder being at a point in the tail pipe below the saddle, the smoke cylinder being connected to the two manifolds just below the exhaust ports. The full heat of the exhaust is thus used on the smoke liquid to insure complete vaporization, less heat being used on the tear gas as it is volatile at the average temperature encountered in its use. The impelling force of the exhaust is used for the distribution of the vapors through a specially constructed "V" tail pipe, which is attached in place of the muffler.

The cylinders are made of three-inch pipe twenty inches long. They must be constructed of extra heavy, seamless pipe in order to withstand the pressure of 150 pounds which it is necessary to apply to force the liquids from the cylinders. The lower ends of the cylinders, next to the rider, are made by welding an end plate into the pipes, while the front or top ends are threaded so that steel caps can be screwed on the full length of the cap threads. The

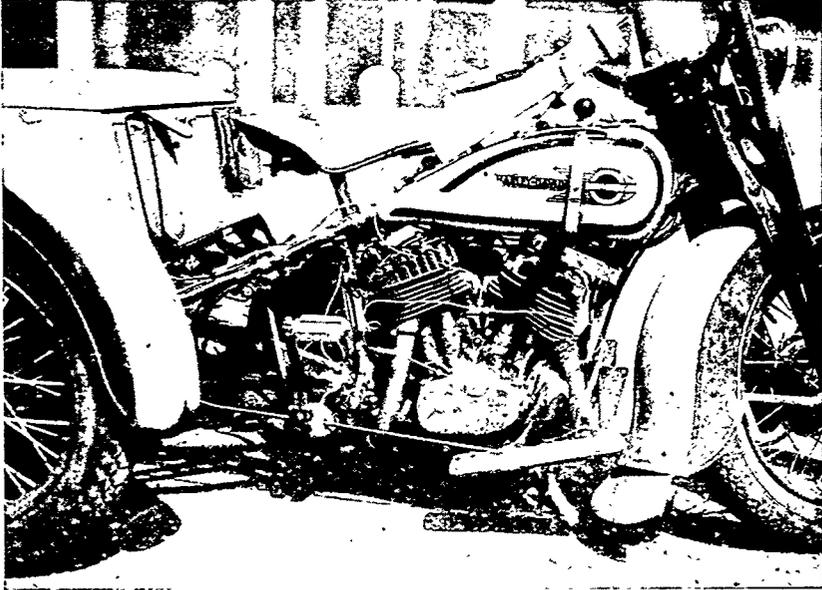


FIGURE 1.

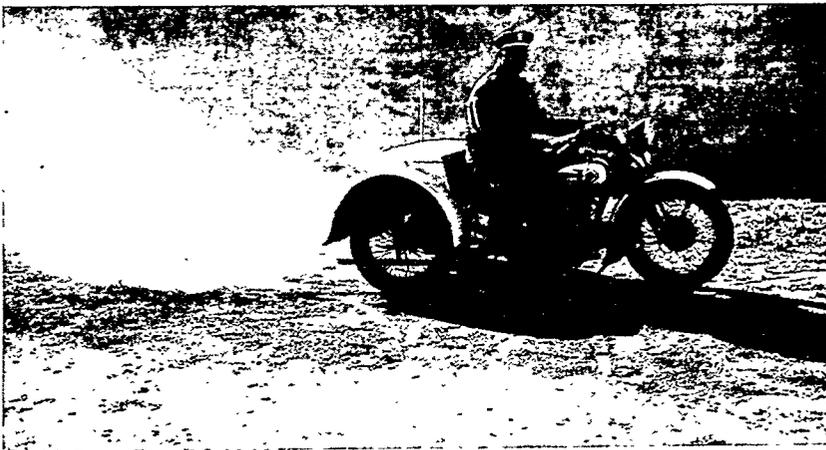


FIGURE 2.

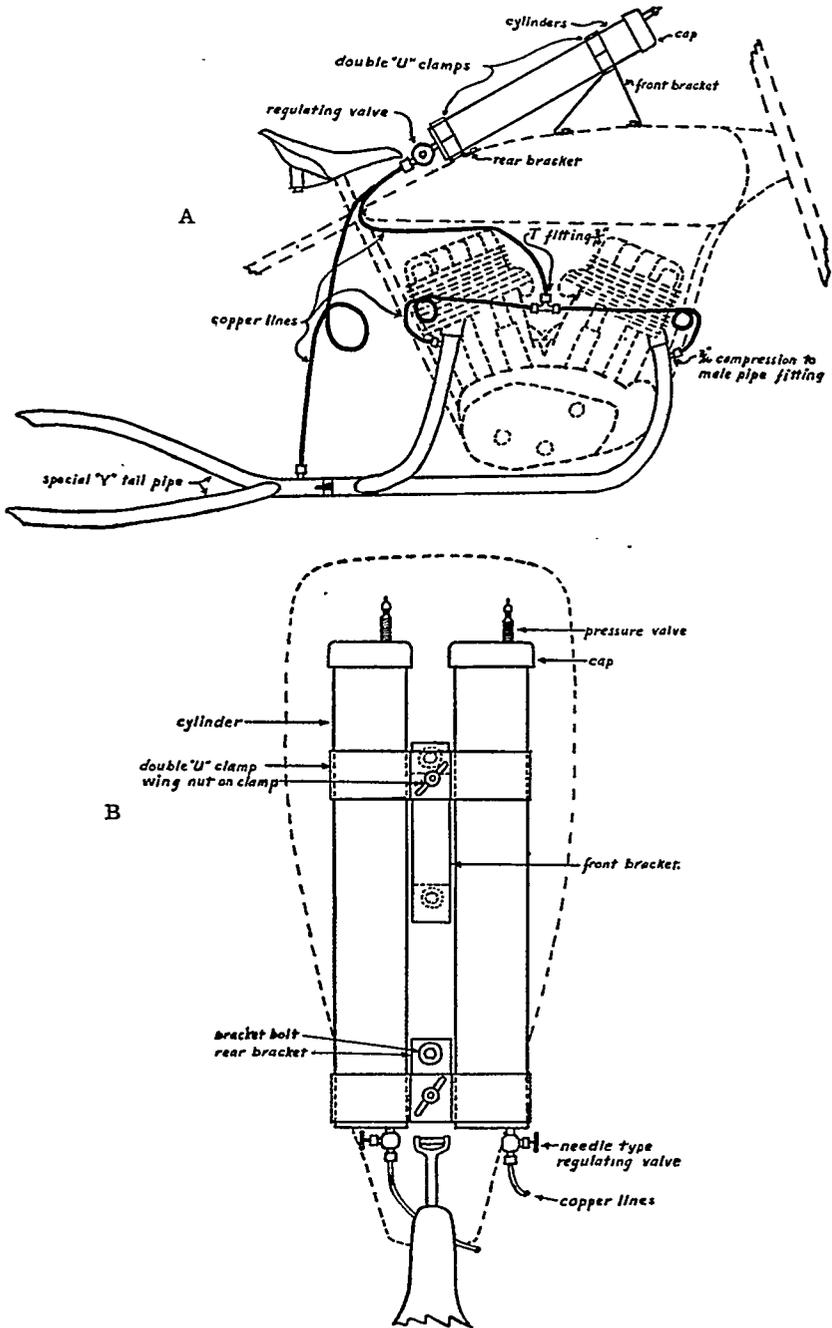


FIGURE 3.

(A) Side view showing cylinder brackets, copper lines, and connections to exhaust system.

(B) Top view showing cylinders and valves and method of mounting brackets and clamps.

caps are placed on the front ends as a protection for the rider in case the threads should give way after continued use and wear, and the caps be blown off. Each cylinder is provided with a screw type regulating stop valve screwed into the end plate at the lower end and then welded into the plate so it will withstand the pressure in the cylinders. These valves, and also the fittings and tubing, are of the type commonly found on gasoline stoves and appliances, and were purchased from a concern specializing in the manufacture of this equipment. The tubing size used is $\frac{3}{16}$ " and all fittings and valves correspond in size. This equipment may be purchased from any store selling repairs for gasoline appliances. A valve stem of the type used in old inner tubes is threaded into each cap at the top end and then welded in. These valves are used in the application of the air pressure to the cylinders and are provided with regular valve stem caps, beside the valves.

The cylinders are mounted above the motorcycle gas tank by double U clamps, as shown in Figure 3 (A and B), the rear clamp being bolted directly on to the frame of the motorcycle just in front of the saddle, while the front clamp is mounted about six inches above the tank, by an angle bracket bolted to the frame. This is done in order to clear the speedometer and controls. The $\frac{3}{16}$ " soft copper tubing is connected to the valves by $\frac{3}{16}$ " compression fittings on one end of the valves. The other end of the valves are screw type which are welded into the cylinder ends. The tubing from the tear gas cylinder extends downward from the valve, past the rear cylinder of the engine, to the exhaust pipe at a point approximately under the rear edge of the saddle. It is connected to the compression end of a fitting which has been welded into the pipe at this point. One or two loops were provided in this line to avoid strains and breaks due to vibration. Introducing tear gas at this point in the tail pipe avoids excessive heat and chances of breaking the gas down chemically, but provides sufficient heat to aid in complete volatilization and consequent even distribution. The connection from the smoke cylinder is brought down from the valve and forward across the top of the rear cylinder of the engine to a point midway between the two exhaust manifolds, where it branches in a $\frac{3}{16}$ " compression T fitting, one branch running to each manifold, where it is connected by a male screw $3/16$ " compression fitting, the screw end being welded into the manifold as close as feasible to the exhaust port. Loops are included in these lines to avoid breaking due to vibration. Figure 3 (A) shows how the tubing is run. This

provides equal distribution of the smoke mixture to each manifold and thereby equal vaporization of the total mixture. The liquid mixture is introduced as near the exhaust ports as possible in order to provide maximum vaporization.

The tear gas cylinder cannot be filled at ordinary temperatures because a large portion of it will be lost as vapor, due to its volatility. The method used to prevent loss of the gas was to immerse the liquid tear gas container and the cylinder to be filled in a solution containing ice and rock salt, as used in freezing ice-cream. If enough time is allowed, the temperature of the containers and liquid may be reduced by this method so that very little is lost by vaporization, if the transfer is quickly made. The lower the temperature the smaller the vaporization loss. An electric refrigerator may also be used to reduce the temperature of the liquid and containers by placing them in or on the freezer coils to obtain quick reduction in temperature. If the refrigerator is a walk-in type, the person charging the cylinder may do so in the box, provided there is no foodstuff or other articles in the box which would be ruined by the tear gas. Whichever method is used, the person charging the cylinders should always be equipped with a tear gas mask.

The liquid smoke mixture is composed of three parts motor flushing oil, as used in service stations, to one part of pyrene, by volume. This may be increased to a mixture of two parts of oil to one part pyrene, with satisfactory results, the exact proportions depending on the weight of oil used. The pyrene holds the flash point of the mixture high enough so that the oil is vaporized without burning. Penetrating oil may also be used, but is more expensive. The mixture may be made and kept in a closed container for some time without deterioration. This liquid produces a dense white fog due to the pyrene in the mixture, and is heavy enough, because of the percentage of oil used, so that it will not rise rapidly and float away, but the mixture is purposely made so it is light enough to rise gradually above the average person's height, thereby obscuring vision and confusing the mob. Two or more machines may be used in tandem where a heavier screen is desired.

The riders should always be equipped with tear gas masks so that they may return to any section where a gas barrage has been laid and because the quick action so often necessary in handling a mob requires clear eyesight. A bridge hat should also be regular equipment, as a protection against stones and clubs. Any attempt to dislodge the rider from the cycle can be successfully repelled by

cutting the front wheel at right angles and spinning the machine in a circle, which will gas all persons in the vicinity of the machine.

When not in use, the equipment is readily removed for storage by disconnecting the copper tubing at the exhaust connections, unbolting the brackets from the frame and lifting the whole assembly off the machine. The exhaust port connections are then closed by dead heads, the special "V" tail pipe unclamped and replaced by the regular muffler and the machine is ready for regular use. Because of the corrosive effect of tear gas on metals, it is removed from the cylinders and kept in rubber stoppered glass bottles, sealed with adhesive tape. The gas cylinders are then flushed out with alcohol, swabbed with light oil and capped. All the equipment except the tail pipes is stored in a metal box two feet square by four feet long.

Here, then, is a means, effective with a small number of officers, of quickly providing a smoke screen in case of minor disturbances, and of dispensing tear gas rapidly and effectively in case of mobs and riots. This method fulfils the requirements set forth in the first part of this article, and yet is flexible in its use, since both the speed of the cycle and the flow of tear gas and smoke may be varied at will. It is felt that, due to its flexibility, this apparatus, once tried, will be a welcome addition to the equipment of all departments.